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GEOLOGY AND PALÆONTOLOGY.

GEOLOGICAL NOTES ON THE CENTRAL BRANCH UNION PACIFIC RAILROAD.

BY PROF. GEO. C. BROADHEAD.

At Atchison, the River Bluffs expose the following sections, numbering from the top:

1. Three feet red clay and soil.
2. One foot boulders, gravel and sand.
3. Four feet red clay.
4. Five feet sand beds in horizontal bands.
5. One foot sand and pebbles.
6. One foot fine sand of yellowish color.
7. Six inches more sand.
8. One foot sand with a few roots.

These may be referred to Loess. The beds resting below are Upper Carboniferous, as follows:

9. Sixteen feet irregularly bedded limestone, chiefly in six inch layers. Corresponds to No. 150, of Geological section of Upper Coal Measures. See Missouri Geological Report, 1872.
10. Four feet brown clay shales.
11. Four feet Bituminous shales.
12. Twenty inches even bed of limestone.
13. Thirty feet shales to railroad.

No. 9, of section above (150 U. C. M.), caps the Missouri Bluffs at most places in Buchanan County, Mo., and affords the principal rock used for foundations at St. Joseph, and also extensively burned into lime at the latter place. Some of its beds abound in *Fusulina Cylindrica*, *Chonetes Granulifera*, and an *Allorisma* is often found near its base. The teeth of two species of fish have also been obtained from it above Weston. At St. Joseph it often abounds in *Orthis Carbonaria* (*O. pecosii*). Handsome specimens of Bryozoans have been obtained from it near Amazonia and also Savannah, Mo.

At the quarries, one mile southwest from Atchison, we find several feet of limestone, (No. 152, U. C. M.), where it has been considerably quarried for foundations of buildings, curbstones, etc.

About eight feet thickness was observed in layers of from a few inches to over a foot. It is a bluish gray, strong limestone, evenly bedded, but sometimes cross laminated, and weathers an iron gray. It is nearly everywhere easily recognized by a two inch layer of "cone in cone" on upper surface. This was observed at Atchison, has also been observed on the other side of the river, near Sugar Creek Lake in Buchanan and in Andrew Counties. It was formerly hauled from near Savannah to St. Joseph and used in buildings.

Near the railroad no such exposures are again seen for 80 miles.

In Marshall County, Kansas, boulders and sand beds of the Drift were occasionally observed. Among the boulders recognized were those of granite, quartzite and greenstone. But little evidence of Drift observed beyond 100 miles.

At Frankfort the hills extend up probably 150 feet above the Vermillion valley and seemed formed, in the lower portion, chiefly of shales for over 50 feet with probably one limestone suitable for building, near the lower part. These beds I refer to are the Middle Permian, the Lower probably cropping out eastwardly.

Toward the top of the hill about four feet of good building stone is quarried. In the quarry it is an ash-gray Magnesian limestone, weathering cream color and works out very freely. The quarry rock is of a very porous texture, caused by the decomposing and loss of numerous *Fusulinæ:* it also contains many chert concretions, which does not seriously interfere with its use as a building stone.

Five miles west the same beds appear in bluffs, but low down, at Barrett's Station.

Still further, several miles, at Bigelow Station, these beds are well exposed, and the stripping exposes to view better layers of stone. A good deal of quarrying has been done here, and preparations are making for much more.

In the beds I observed the following fossils: *Productus semi-reticulatus*, with *Fusulinæ* very abundant, but other fossils very rare.

The following is about a general section of rocks seen at Blue Rapids, ten miles further west, and includes beds still above those just named, and also Permian:

1. On hilltop a bed of limestone near summit.

2. 100 feet probably all shales; same chert on slopes.

3. Four feet Magnesian limestone in layers of four to twelve inches.

4. Fifteen feet shales with small geodes.

5. Four feet limestone in sixteen inch layers; color, whitish drab with blue chert between the layers. This limestone is much used in building at Blue Rapids, and affords a handsome building rock.

6. Thirty feet shales.

7. One and one-half feet good bed of building stone, coarsely cellular; also extensively used.

8. Thirty feet shales, red in lower part.

9. Four feet limestone.

10. Four feet nodular shales.

On river bluffs above, the red shales at several places carry lenticular forms of gypsum, often snowy, and in quantity sufficient to utilize. There is a mill at Blue Rapids constantly engaged in grinding it up for plaster. Some of these beds are nine feet thick. A strange feature was observed in some of the lower beds of these rocks. In five feet thickness observed four beds of rock of nearly uniform thickness, sixteen to twenty inches, each one with a layer of blue chert on top.

Fusulina cylindrica abounds, also found *Athyris subtilita, Productus semireticulatus, Chonetis granulifera, Eumicrotis hawrii, Hemipronites crenistria.*

Borings at Blue Rapids reveal a thin coal seam, only a few inches.

Five miles west, at Waterville, we find the rock corresponding to that on hilltop at Blue Rapids, but here it lies not far above base of hill, and is the chief rock used for building purposes. It also corresponds to the Mayville rock.

At Palmer Station we find that we have left the Upper Carboniferous and Permian and entered the Cretaceous. The red sandstone of the Dacotah stands out prominently at Palmer. At Concordia this sandstone lies low in the hills, and is used in the construction of buildings, as is also the lower beds of the Ft. Benton Cretaceous. At Beloit and Cawker they obtain a ten-inch bed of very tough limestone, but at the same time soft enough to saw or cut easily. Half the buildings of these towns are constructed of it. It is a yellowish brown color with a dark brown or red band at the center, along which it can be split.

Inoceramus problematicus was almost the only fossil seen.

At Glen Elder there is exposed about thirty feet of shales, and thin limestone layers of the Ft. Benton group. Off from the railroad these beds contain *Ammonites.*

A wonderful thing is the Spirit Spring three miles east of Cawker. We here find a knoll of thinly laminated rock about twenty-five feet high, 100 feet across at summit and 300 feet at base. Between this knoll and adjacent bluff lies a hollow twenty-five feet deep. The slope is gradual on all sides except the south, where it is perpendicular. On top we find a spring sixty feet in diameter, and having a margin of not over twenty feet outside of the water to connect with the

descending slope. The water is strongly saline, and depth reported to be over 100 feet. Water is constantly at surface and trickles over gently. The Indians are said to have ascribed great virtue to it, or rather to have worshipped it as a "totem," or medicine — their WAKONDA, which name is now often applied to it.

Beyond Cawker we soon find higher rocks of the Cretaceous. Above Portis, at Kirwin, Logan, and Bull City, the white and cream colored beds of the Niobrara group appear. Much of this rock is of snowy whiteness or cream color, easily cut or sawn, and can be readily whittled with a knife. One-half the buildings of these towns are constructed of it. It looks very handsome, is not strong, nor will a wall built in a damp place stand wet and frost. It does well in the absence of better. The rock contains *Haploscapha Rudistes* and *Ostrea.*

At Bull City on South Solomon, in Osborne county, about twenty-five feet is exposed, resting on fifty or more feet of dark shales. Some of the beds of this formation contain fossil fish and those wonderful *Saurians.*

ARCHÆOLOGY.

PREHISTORIC MAN IN AMERICA.

(*Concluded.*)

BY PROF. EDWARD S. MORSE.

If we now look at civilized man, we find him distributed in every part of the world, and history and tradition in most cases give us information as to the manner of this distribution. Believing that in past times, as at present, colonizing went on in similar ways, we infer that neolithic man became more widedly scattered than his predecessors. Whenever we turn our eyes, from one side of the earth to the other, the age of polished stone implements at one time existed. More important still is it to consider that paleolithic man seems to be just as widely distributed. His remains in river-drift and other places have been found in England, France, Portugal, Greece, Italy, Africa, Palestine, the Indian Peninsula and Northern India, New Jersey, and California. Thus we have this early man spread over nearly the whole world; and, so far as we can judge from his rude implements, identical under all conditions of climate and surroundings. Surely such a distribution must not only indicate an enormous lapse of time, during which he remained in this condition and slowly found his way to different parts of the world, but must of necessity, presuppose the existence of a more primitive people from which these had sprung. Had these also become so widely scattered? Compare these rude men with those of Europe, and consider how long a knowledge of the Western Hemisphere was hidden from the latter. How infinitely slow must have been the colonizing of continents in paleolithic ages and in ages more remote!

These considerations, in regard to the not improbable existence of man in the middle, and, possibly, in the earlier tertiaries, are offered that the reader may be better prepared to appreciate the remarkable discoveries of the remains of man in the auriferous gravels of California. An elaborate memoir on this subject, by Professor J. D. Whitney, has just been completed in a second part, forming one of the publications of the Museum of Comparative Zoology at Cambridge.

Professor Whitney, formerly the director of the geological survey of California, has, in the memoir referred to above, described at great length the evidences regarding the genuineness of the famous "Calaveras skull," repudiated as a hoax by the press generally, made doubly famous by the witty verses of Bret Harte, and looked at with suspicion or ignored by archæologists of great repute. The reader must be referred to the pages of Professor Whitney's memoir to appreciate the force of the evidences he there brings forward in support of the claims he has made regarding the genuineness of the occurrence of human remains from beds of pliocene and possibly of miocene age. Were this skull the only object of this nature that had been found in the auriferous gravels, one might perhaps be justified in questioning it.

The truth is, however, that in ten different counties in that great region, remains of man, associated with extinct mammals and buried at great depths in the auriferous gravels, have been brought to light. It is true that in many cases the evidences have been produced by miners, but among that class are many intelligent men. In their vocation, too, they are specially seeking for definite objects, namely: particles of gold. Their experience is not like that attending the rough excavations of railroad cuts or canals. Their work has been accompanied by a scrutiny which adds positive weight to their statements. Of great importance, too, is the uniformity of their testimony, as Professor Whitney points out, and the invariably rude character of the implements which they produce from these beds. Any attempt at deception would certainly bring with it some rudely carved image, or stone with rude characters engraved thereon. No collusion is conceivable between so many observers, covering so many years, and working in so many widely separated localities.

Among the many notable examples cited by Professor Whitney, that of the occurrence of human remains beneath Table Mountain is the most remarkable. In this case, tunnels had been driven in horizontally beneath the basaltic cap of the mountain, which is of great thickness. The tunnels being horizontal, there was do possibility of *débris* falling from above, with the chance of conveying surface specimens. The great age of the gravels beneath Table Mountain is shown by the profound geological changes which have taken place in the surface features of that region since the volcanic outflow formed the almost imperishable cap which has preserved this area and similar areas from the wide denudation that has taken place around. The basalt forming the cap of Table Mountain extends in an even plateau, though interrupted by deep gorges and cañons, for a distance of twenty miles, with a descending grade, as measured by barometric

observations, of about eighty feet to the mile. It is inconceivable on any hypothesis that this ancient lava-flow could have followed any mountain ridge or spur. Indeed, all the evidence goes to show that it followed an old river-bottom, with its superimposed beds of gravel and horizontally depostted layers of sand and clay.

While this lava-stream formerly occupied a river-channel, presumably depressed below the surrounding country, now this consolidated mass stands far above the deep gorges and cañons that have been furrowed out since. In other words, this region, once a valley, is now in turn a mountain! The enduring nature of the basalt has partially protected these plateaus from the universal erosion of that area. Beneath this basaltic mountain tunnels have been run, in one case to a distance of nearly a third of a mile.

The old river-bed upon which Table Mountain rests has been found, with its characteristic worn pebbles and bowlders, and gold has been got in precisely such positions as it would be found to-day in existing rivers. And from these tunnels, even from one which measured nearly a third of a mile in length, the remains of man in the shape of his actual bones, as well as beads, rough pestles, and other relics of human fabrication, have been brought to light, and these discoveries have been made, not by one man, but by many. Their sworn statements are given, and the specimens collected by different people, at different times, now enrich the collections of the California Academy of Natural Sciences, the Philadelphia Academy of Natural Sciences, and the Museum of the Boston Society of Natural History.

In regard to the famous skull itself, we can do no better than to quote from Professor Whitney's preface to Part II, wherein he says that "all those who refuse to accept my conclusions as to the great antiquity of man in California, do so on the ground that the Calaveras skull was not taken from its bed by the hand of a scientific man. In so doing, they not only ignore the evidence presented by the skull itself, which is positively a fossil, and was chiseled out of its gravelly matrix in the presence of several eminent authorities, but they also reject the very full testimony from other quarters, some of which comes from men of education, and even of professional education. The body of the other evidence is so great that it does not appear to me that it would be materially weakened by dropping that furnished by the Calaveras skull itself."

The voluminous testimony offered by Professor Whitney will impress all who read this volume dispassionately.

In regard to the age of these remains, Professor Whitney says that "it will be safe to say that the human race in America is shown to be, at least, of as ancient a date as that of the European pliocene; and to have an idea how far that epoch is from the present one, it is only necessary to recall the amount of erosion which has taken place since the cessation of volcanic activity in that part of the sierra in which lie the formations which have been described in the present volume."

Whatever age geologists may ascribe to the auriferous gravels, sufficient proof, in our mind, has been adduced to show that man lived at the time of their deposition, and that the mammals and plants then living are now extinct. The plants, according to Lesquereux, are of pliocene age, and some identical with, or closely allied to, miocene forms.

On the eastern coast of North America, we have the important discovery, by Dr. C. C. Abbott, of true river-drift implements in the Delaware Valley of New Jersey. From the testimony of eminent geologists the Trenton gravels were deposited at the foot of the retreating ice-sheet. In the Tenth and Eleventh Annual Reports of the Peabody Museum of American Archæology and Ethnology, Dr. Abbott has published full accounts of his discoveries. The implements were obtained from depths ranging from five to ten feet below the surface, These are precisely of the same nature as those characterizing the river-drift men of Europe. If Dr. Abbott's conclusions are correct, then the gravel-beds in question are a part, so to speak, of the glacial epoch.

That man existed contemporaneously with their deposition, there can be no doubt.*

The probable relation of the paleolithic man of Europe with the Esquimaux of North America has been suggested by Professor Dawkins, and Dr. Abbott supports this supposition with other evidences. In this connection, it is interesting to remark that while the breadth of the Calaveras skull, according to Professor Wyman, agrees with the other crania from California, except that of the Digger Indian, it differs in dimensions from other crania, and in these differences it approaches the Esquimaux.

The wide distribution of these remains, from distant India throughout Europe and across the American continent, shows a race, judging from their implements, apparently homogeneous, and indicates an immense lapse of time for the dispersion of these people. Their precursors must be recognized by their bones, for implements, to be distinguished from ordinary stones, are not to be expected. The improbability of encountering these remains has already been pointed out.

If man has descended from some ape-like progenitor, or, rather, if he and the present apes are derived from a common ancestor, then we must expect to find the early remains of man closely drawing near, in his characters, to that hypothetical form which is looked for in "the missing link." Thus far all the characters of the early remains of man point distinctly in that way, though many a long gap must yet be filled before the sharp lines of demarkation between the higher groups break down. From the exceeding rarity of the remains of the order of primates, the different groups stand quite as isolated as man from them. Not to speak of the gaps yet to fill between the different genera of the higher

*If the views of Mr. Henry C. Lewis regarding the Trenton gravels are correct, then their connection and superposition on the red gravel and brick clays indicate a second and much later glacial period, corresponding to the reindeer period of Europe. Whatever the facts may show, the identity of the Trenton river implements with those of the river-drift of Europe seems well established.

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apes, a great gap separates the true apes from the half-apes or lemurs, and these in turn have affinities with the most aberrant and puzzling forms, like the aye-aye and tarsier, with its extraordinary long tarsal segment, so that we have the affinities of man brought by quick passage, as it were, to the lower levels of the mammalia; and in this connection it is interesting to observe that in the lower eocene, both in Europe and America, lemuroid forms have been discovered.

In recalling the low characters of ancient man, it is not necessary to mention here the oft-repeated examples of the Neanderthal and Engis skulls of Perigord, the jaws of La Naulette, Moulin Quignon, and a host of other examples now classic in the literature of the subject, and the equally remarkable remains in this country, such as the platycnemic tibiæ of Michigan, and the remarkable skull from that region, with the temporal ridges nearly approximating. Suffice it to say that, just as we find the remains of man at lower levels, so do we find his characters in the main departing not only from the higher race of to-day, but in the same proportion approaching a type which is ape-like. If we examine the races to-day we find the savage groups presenting a number of low characters, such as a deficiency of the sharp ridge at the base of the nostrils, differences in the proportion of of the pelvis, in some the foramen magnum farther back; a certain percentage of perforated humeri, prognathism, and other characters, all of which are an approach to the apes, and a departure from higher man. No one savage race possesses all these characters, but each race has some of them. If we look for these characters among the higher races, we meet with them rarely. Thus, the percentage of perforated humeri in the white race is very low. Of fifty-two humeri examined by Wyman, only two were perforated. In the present Indian and Negro, this peculiarity occurs more frequently, and in the prehistoric races of America is very common. Wyman found in a Florida mound thirty-one per cent perforated, while Gillman estimated the percentage of perforated humeri in a Michigan mound as at least fifty per cent. He has furthermore pointed out the interesting fact that these low humeri are associated with successively flattened tibiæ.

If now we note successively the percentage of low characters revealed in the higher races of to-day, in existing savages, in the races, both savage and civilized, at the dawn of history, and finally, in those savage races which alone existed in neolithic and down through to paleolithic times, we find this percentage becoming greater as we descend. So marked is the increase that one may almost predict that, when still more remote horizons yield their human remains, an enormous percentage, if not at all, will be found with low, receding foreheads; heavy frontal crests; rounding of the base of the nostrils; a nearer approximation of the temporal ridges; a greater posterior position of the foramen magnum; the absence of a projecting chin; ape-like proportions of the molar teeth; perforated humeri; quadrumanous proportions of the pelvis; flattened and saber-like tibia; conspicuous roughnesses and ridges for the attachments of muscles, and other low osteological characters, all pointing in one direction. Of the soft parts, the amount of hairiness and the racial character of the hair, the persistence of ape-like muscles,

which at the present time occur but rarely, or of their habits and mental attributes, nothing, of course, can be known.

These characters, when found, will have become merged so completely with those of the ancestors on another line that new genera will have to be erected to embrace them. This conclusion brings no strain upon the accepted methods of logical deduction. For these remains we are still seeking.

There are many species of mammals whose early progenitors are not known, and, though many wide and important gaps in conspicuous groups of mammals have been filled up, thanks to the labors of our American paleontologists, there are many "missing links" in the groups as well as in that group to which we belong. The intense impatience to fill this gap in man's genealogy arises from the special interest that man naturally feels in his own species. How long we have patiently waited for those links which Geoffroy St. Hilaire so earnestly looked for—the closing up of wide gaps between the paleotherium, hipparion, and horse; and who could have foretold in his day that, in the wild regions far beyond the Mississippi, amid hostile savages, these precious remains would be brought to light!

Many other intermediate forms, of equal importance in forming connected series, though not so well known to the public, have been discovered by Leidy, Marsh and Cope. Indeed, such intermediate and generalized forms have been added to the mammalia that we have creatures combining the characters of the pigs and ruminants, animals possessing the characters of the hoofed beasts, carnivora, and rodents! Professor Flower, the distinguished English osteologist, confesses that the modern classification of mammals completely breaks down in the light of these revelations. Cuvier's law of the "Correlation of Structures," although applicable within certain limits, would have led him into the gravest errors as applied to the fossils known at present. Professor Marsh, in his address on the "History and Methods of Paleontological Discovery," says that if Cuvier "had before him the disconnected fragments of an eocene tillodont, he would undoubtedly have referred a molar tooth to one of his pachyderms, an incisor tooth to a rodent, and a claw-bone to a carnivore."

The sharp lines of demarkation which discriminate the various groups of mammals in Cuvier's day have been, in many cases, rounded off or completely obliterated. Man, who is still seeking his own phylum with those of many other species of mammals, must patiently wait.

Huxley, in his courageous little book on "Man's Place in Nature," published nearly twenty years ago, closes by asking the question: "Where, then, must we look for primitive man? Was the oldest *Homo sapiens* pliocene or miocene, or yet more ancient? In still older strata do the fossilized bones of an ape more anthropoid, or a man more pithecoid, than any yet known, await the researches of some unborn paleontologist? Time will show; but, in the meanwhile, if any form of the doctrine of progressive development is correct, we must extend, by long epochs, the most liberal estimate that has yet been made of the antiquity of man."—*North American Review.*

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GEOLOGICAL CHART;

Including the Rock Scale of Geological Periods and the "Zoic Calendar of Creation." Compiled from the works of Agassiz, Lyell, Huxley, Hæckel, Dana, LeConte, and other first rank authorities in Science at the present time. By HIRAM A. REID, Secretary State Academy of Sciences at Des Moines, Iowa. [Published by permission of the Author.]

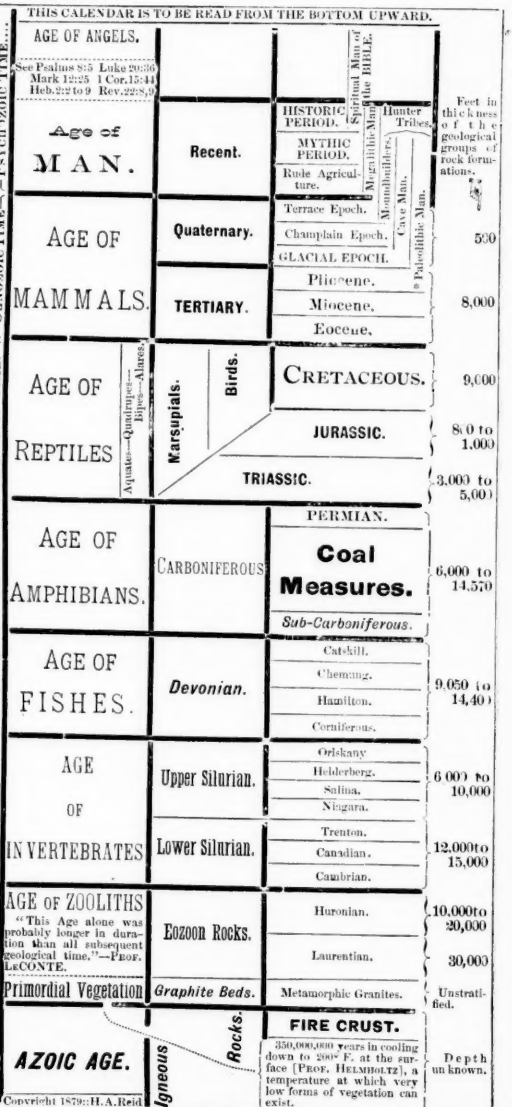
EXPLANATION.—The side line at the left shows what portions of geological time are comprehended in the terms "eozoic," "paleozoic," etc. The first column shows the periods or "Ages" of geological time during which the different successive types of animal life predominated, or were the highest types then in existence. And these two divisions form the "Zoic Calendar of Creation."

The second column shows the great general groupings of rock strata, in which are found the fossil remains of the corresponding animal types named in the first column. But, at the "Age of Reptiles" occurs a grand divergement, for it was during this age that animal life pushed out into its most wonderful developments; and there came into existence strange and marvelous forms of swimming reptiles, four-footed and two-footed walking reptiles, and two-footed and four-footed flying reptiles. Here also the true birds began to appear, though with reptilian peculiarities; and likewise the marsupial animals, which are a transitional type, between reptiles that produce their young by laying eggs and the true mammals, that bring forth their young well matured and then suckle them.

The third column shows the lesser groupings of rock beds as classified by our American geologists; but many minor subdivisions and local groups are omitted for want of space. At the top of this column are shown the geological periods of first appearance of races of man, so far as now authenticated by competent scientific authorities.*

The fourth column shows the number of feet in thickness of the different groups of rock layers as indicated by the braces.

This Chart is the most comprehensive and thorough in its details, and yet the most systematically and graphically presented to the eye, of anything in its line that has ever yet been published. Here is the whole story of geology and the ascent of life condensed into the space of a few inches, yet so plainly set forth as to readily fix itself in the memory like an outline map. Scientific terms in newspapers and magazines often catch the reader at a disadvantage; but a reference to this chart will at once show the relative place or period in creational progress to which the best authorized geological terms apply. It reaches, like a Jacob's ladder, from the lowest inklings to the highest ideals of life on the earth, as taught by modern science and the Christian Bible.



* "The existence of Pliocene man in Tuscany is, then, in my opinion, an acquired scientific fact."—See Appletons' International Scientific Series, Vol. XXVII, p. 151. "The Miocene man of La Reanee already knew the use of fire, and worked flint."—Ib. p. 243. See also, Prof Winchell's "Pre-Adamites," pp. 426-7-8. "The human race in America is shown to be at least of as ancient a date as that of the European Pliocene."—Prof. J. D. Whitney. Similar views are held by Profs. Leidy, Marsh, Cope, Morse, Wyman, and other scientists of highest repute.

HISTORICAL NOTES.

FORT ORLEANS ON THE MISSOURI.

JOHN P. JONES, KEYTESVILLE, MO

The exact location of this French fort, or post, is at present unknown, and acn only be determined approximately by locating as near as possible the former home of the Missouris, as all the early French writers who mention it agree that it was near the principal village of that tribe.

Dumont,* one of the earliest and best of the French annalists, gives an extended account of the erection of the fort, but says nothing positive as to its location, except that it was in the "vicinity of the Missouris." Du Pratz,† in his *Historie*, says: "For some time there has been a French post on an island of some leagues in length opposite the Missouris. The French have established this fort at the east point, and named it Fort Orleans. M. de Bourgmont has been in command there long enough to gain the friendship of the nations of the country near this great river, and to make peace among them."

M. Bossu, a Captain in the French service, who published two volumes of travels in Louisiana,‡ mentions the fort as being near the Missouris. In another place he says: "Baron Parneuf, who has been Governor at Fort Orleans, established in the nation of Missouris, and who knows the nation well, has informed me that they were formerly very warlike, etc."

From these quotations it will be seen that the fort was unquestionably located near the Missouris, and if we can determine their location, we shall be able to very nearly establish the position of the fort. M. Dutisné, of the Kaskaskias, who visited the Missouris in 1719, says in his letter to Bienville§ narrating the trip: "It is eighty leagues to the village of the Missouris by the river of that name."

Father Charlevoix, one of the best informed of the early writers on Louisiana, says in his journal under date of October 20, 1721: "I have just now seen a Missouri woman, who told me that her nation was the first we meet going up the Missouri. It is situated eighty leagues from the confluence of that river with the Mississippi."

. Eighty leagues would make the location of the village, or home, of the Missouris near the present mouth of Grand River, in Chariton county, and travelers who ascended the Missouri in the early part of the present century corroborate the statements of M. Dutisnè and Father Charlevoix.

*Historical Memoirs of Louisiana. By M. Dumont, 2 vols.: Paris, 1753.

†History de la Louisiana. By Le Page Du Pratz, 3 vols.: Paris, 1758.

‡New Voyages, etc , containing a relation of the different people which inhabit the environs of the Grand River St. Louis, generally called Mississippi, etc., 2 vols. By M. Bossu, Captain in the Marines: Paris, 1768.

§Historical Journal of the establishment of French in Louisiana. By Bernard de La Harpe: Paris, 1831.

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Lewis and Clarke,* who ascended the river in 1804, mention the village as follows: "On the 13th we passed a bend of the river and two creeks on the north called the Round Bend Creeks.† Between these two creeks is the prairie in which once stood the ancient village of the Missouris. Of this village there remains no vestige, nor is there anything to recall this great and numerous nation except a feeble remnant of about thirty families. Opposite the plain there was an island and a French fort, but there is now no appearance of either, the successive inundations having probably washed them away, as the willow island which is in the situation described by Du Pratz is small and of recent formation."

Mr. John Bradbury,‡ an English traveler who ascended the Missouri in 1811, says in his book under date of April 2, 1811: "We this day passed the site of a village on the northeast side of the river, once belonging to the Missouri tribe. Four miles above it are the remains of Fort Orleans, formerly belonging to the French. It is 240 miles from the mouth of the Missouri." There seems to be a discrepancy between the statements of Mr. Bradbury and those of Lewis and Clarke as to the remains of the fort. I do not believe that there could have been as late as 1811 any traces of its former existence visible, neither do I think it was located four miles above the village. Lewis and Clarke, following Du Pratz, expected to find the island on which it stood directly opposite the site of the village. Du Pratz was never up the Missouri, and had no personal knowledge of the position of the fort. I infer that he intended to convey the idea that the island was near the Missouris rather than directly opposite to them. About eight miles by the river course, down stream from the old village, there is now and has been ever since the country was surveyed by the Government, a large island, and on this I believe Fort Orleans was situated.

Mr. H. M. Breckenridge, § who ascended the Missouri river in 1811, gives in his journal a table of distances from the mouth of the Missouri, and at 236 miles he says: "Ancient village of the Missouri Indians, near which formerly stood Fort Orleans."

The foregoing extracts, I think, show conclusively that the Missouris were located about 240 miles up the Missouri river from its mouth, and that Fort Orleans was in their immediate vicinity. The erection of Fort Orleans has been ascribed by some writers || to the fears of the French awakened by the Spanish expedition of 1719, which was destroyed by the Missouris. This could not have been the cause. Information of that expedition did not reach New Orleans until

*Lewis and Clarke, History of the Expedition to the Sources of the Missouri, etc. Paul Allen edition, 2 vols.: Philadelphia, 1814.

†Now called Palmer's Creek, after a noted character in the early history of Grand River Valley, who once resided near it.

‡Travels in the Interior of America, 1809, 1810, 1811, with a Description of Upper Louisiana. By John Bradbury: Liverpool, 1817.

§Views of Louisiana, with a Journal of a Voyage up the Missouri river in 1811. By H. M. Breckenridge: Pittsburg, Pa., 1814.

||Notably Stoddard in his Sketches of Louisiana, published at Philadelphia in 1812, and whose ideas have been copied by succeeding writers.

April, 1721, while the building of the fort was planned in France in 1719, executed the following year, and originated as follows:

The death of Louis XIV left France with an immense public debt, a legacy bequeathed by his military glory, and when the Duke of Orleans, in 1716, as Regent of France, found himself at the head of the Government, the financial situation of the empire had become desperate. The load of taxation required to merely pay the interest on the debt was overwhelming. In fact, the crisis was such that it was proposed in the Council of State to expunge the whole debt by an act of national bankruptcy. It was at this time when the wisest financiers were not able to see their way through the embarrassments of the treasury that John Law came forward with his panacea—the creation of a bank by which fictitious capital could be produced at will. His bank was chartered in 1716 as a private institution, but met with such success that it was changed in 1718 to the Royal Bank, of which he was named the Director-General. In the meantime other financial delusions in the shape of stock companies were inaugurated, and among them "The Western Company," afterward known as Law's Mississippi Scheme.* To this company the exclusive right to trade with Louisiana for twenty-five years was given, also the right of making grants of land, of levying troops, raising fortifications, appointing Governors of the colony and officers commanding the troops; in fact, they received almost sovereign powers over the entire Mississippi Valley.

Among its other privileges, the company was to be absolute owner of all the mines discovered, and great expectations were based on the revenues these undiscovered mines were to yield. The country of the Missouris was thought to be especially rich in lead and silver, and Capt. De Bourgmont, who had served several years in Canada and Louisiana, but was at this time residing in France, represented to the directory of the company that it would be advantageous to establish a fort on the Missouri river, near the tribe of Missouris, as in addition to the profit that could be derived from their trade, the knowledge of the country possessed by the Indians would be of great advantage to the company in their search for minerals.

The project was favorably entertained by the company, and De Bourgmont was authorized to proceed to the country of the Missouris and establish the post, of which he was to be the commandant. He proceeded at once to New Orleans, arriving there in 1720, and upon presenting his authority to Bienville, three boatloads of provisions and other necessaries for the execution of his plan were furnished him. His military force consisted of thirty soldiers, two commissioned officers, and a sergeant named DuBois. To these were added several boatmen and Canadian voyagers, or *courier de bois*, together with some traders licensed by the company. They left New Orleans in the summer of 1720, and proceeded

*This branch of Law's financial schemes was of great benefit to Lonisiana. The resources of the country were advertised with the prodigality that characterized all of his undertakings. The press teemed with publications on the subject, while pamphlets setting forth the great advantages the country possessed were scattered broadcast. Hundreds were induced to go to Louisiana, and the result was that the colony received an impetus which it would have been long in gathering but for Law's Company.

directly to the country of the Missouris and were well received by the tribe. A palisade fort was erected, with a cabin for the officers and barracks for the soldiers, and named Fort Orleans in honor of the Regent. During the year a proclamation was issued throughout the colony of Louisiana informing the inhabitants that they might obtain all the merchandise and provisions at cost from the stores of the company at Mobile and Dauphine Island, necessary to their wants, but if they had to be delivered at the Illinois and Missouri posts an addition of fifty per cent. would be taxed.

De Bourgmont acted the part of a judicious commandant and established peace between the various Indian tribes inhabiting the country about him. In 1724 the Padoucahs,* in the west, still remained hostile, and to bring them into his confederacy he organized an expedition to their country. On the 25th of June of that year he dispatched a detachment of his command, under Ensign St. Ange, to apprise the Padoucahs of his intended visit, and on the 3d of July followed them with twenty soldiers, one hundred Missouris and eighty-four Osages. After reaching the Kansas tribe his health failed him and he returned to Fort Orleans, arriving there Aug. 5th. Sept. 25th he again set out and in due time reached the country of the Padoucahs, where he concluded a peace with that nation. On his return to Fort Orleans he was received by St. Ange, Sr., with a discharge of cannon and musketry, and upon entering the fort the Te Deum was sung in thankfulness for the happy result of the expedition.

The next year DeBourgmont, tiring of his wild life, arranged to return to France, and by telling wonderful stories of that country and distributing presents, persuaded twelve Osages and Missouris to accompany him, among them the daughter of the great chief of the latter tribe. Embarking with these Indians, some traders and a sergeant named DuBois, the commandant descended the Missouri. Upon reaching the Mississippi a visit was made to Kaskaskia, where Chicagou,† an Illinois chief, was persuaded to join the party. Descending the Mississippi they landed at New Orleans, where they rested a few days and then embarked for France.

Upon arriving in France they were presented at Court and were royally entertained by the Mississippi Company. They then appeared in Paris‡ and danced Indian dances at the Italian Theater, and hunted a stag in the Bois de Boulogne, by running. The chief's daughter embraced Christianity and was baptized at Notre Dame, after which Sergeant DuBois married her, and in consequence of this alliance was made a captain and commandant of the Missouris. Great advantages were expected to accrue to the company from the conversion of the Missouri princess, as she was styled, and her marriage with Captain DuBois. She received presents from the ladies at Court, among others a fine gold watch, while the warriors received blue coats trimmed with gold, and laced hats. The time arriv-

*Comanches.

†Son of the chief Chicagoes-eo mentioned by Marquette and LaSalle.

‡The London *Postman* of January, 1726 contains an account of the reception granted these Indians.

ing for their departure they set out well satisfied, and repairing to L'Orient, embarked for home. DeBourgmont remained in France and was rewarded for his great services to the company by being created a Knight of St. Louis.

Upon the arrival of Capt. DuBois and party, at New Orleans, they were grandly entertained at the expense of the company, which also furnished them with a boat and boatmen to take them to Fort Orleans, where they arrived in due course of time. There was great rejoicing among the Missouris to see their friends return, and especially to see them possessed of more treasures than they had before conceived of. Dances and games were inaugurated in the village and the friendship existing between the French and Missouris seemed to be more strongly cemented than ever. Mrs. DuBois lived at the fort with her husband, seemingly happy in having adopted the customs of the whites. Such was the condition of affairs when the boats that brought the party from New Orleans set out on their return. Early in the following spring some traders from Kaskaskia came up the river to trade with the Missouris, but on reaching their village found no evidence of Fort Orleans except its blackened ruins. It had been given to the flames, while the fate of its garrison had been the same as that of many other outposts. Had a single victim been spared he would have probably told the familiar story of treachery, surprise and massacre, ending in torture at the stake for those who unfortunately escaped the first onslaught. But not a single Frenchman was spared, and the history of the causes that led to the massacre, and the details of its execution will for ever remain unwritten. Madam DuBois was found by the traders to be living with her own people, having renounced Christianity and resumed the manners and customs of her people. She has been thought by some to have been in some way connected with the massacre. Several years later she married a captain in the French service, named Marin, and in 1751 a daughter by this marriage was living at Kaskaskia. Fort Orleans was the first and last French post in the country of the Missouris.

BIOLOGY.

MIVART ON THE CAT.

The great advances that have been made in biology—the science which treats of all living organisms from man to the lowest plant—and the important changes that have been wrought in men's minds in consequence, have impressed Dr. Mivart with the conviction that the natural history of animals and plants needs to be rewritten, and the field of nature surveyed from a new stand-point. In the preparation of such a history two ways were open—either to begin with the lowliest and most simply organized of living creatures, and gradually ascend to

t he highest and most complex in structure, or to begin with the latter, and from thence descend to the consideration of the lowest kinds of animated beings. Dr. Mivart gives the preference to the last-named course, and deviating in its execution from the historical practice of beginning the study of animals and plants with man, as the type of the highest class, for various reasons, which he states with great cogency, has preferred to select for examination and comparison some other animal, easily obtained, of convenient size, belonging to man's class—that of mammals—and not so different from him in the structure of its limbs and other large portions of its frame but that analogies between it and him may readily suggest themselves. He has selected the common cat as most fully satisfying these conditions, and in an exhaustive treatise, which he entitles "The Cat," and which he intends as an introduction to the natural history of the entire group of backboned animals, as well as to zoölogy generally and to biology, he presents the results of his elaborate study of the zoölogy of the cat, treating the subject so as to give the student of biology such a knowledge of anatomy, physiology, and the kindred sciences as may enable him to study profitably the whole class to which it belongs.

Concluding that the study of the anatomy and physiology of the cat might be best pursued by investigating the function of each organ and set of organs, and their structure, in the performance of his task Dr. Mivart has treated of these in successive chapters, in the following order: the skeleton, the muscles, the organs of alimentation, of circulation, of respiration and secretion, of generation and reproduction, the nervous system and the organs of sense, the development of the body, and psychology. Having thus disposed of the facts of structure and formation, he then proceeds to consider the various affinities of the cat to other animals (in this chapter including a full and interesting account of all the different kinds of cat, wild and domesticated), and its relations to space and time, or, in other words, its place in nature. In following out this plan, Dr. Mivart treats elaborately upon the anatomy, physiology, psychology, taxonomy, and hexicology of the cat, unfolding the processes of individual development, or the series of changes gone through by each individual of the cat species in reaching maturity; and in a concluding chapter he considers the development of the species, and gives his conclusions as to the pedigree and origin, both of the cat considered as a species and of the whole family of Felidæ. In arriving at his conclusions on this head he rejects as a crude and inadequate conception the theory that the origin of species is due to natural selection, and maintains that the genesis of new species is due mainly to an internal cause, which may be stimulated or aided, or may be more or less restricted, by the action of surrounding conditions; that all our knowledge being derived from experience, we can only judge (apart from revelation) of things as they have been by things as they are; that as every animal is now the product of a parent organism more or less like it, so any antecedent animal also was the product of a parent organism more or less like it; that we do daily see the origin of concrete embodiments of ideas which are not

only as distinct as one species from another, but are distinct as genera, families, orders, classes, and even kingdoms; that according to our present experience any new specific form would make its appearance during the period of embryonic life, and that such variations are capable of being transmitted to the offspring of the animals in which they first arise; that at various stages of individual evolution, sudden changes, caused by an acceleration or by an arrest of the development process, or even by some retogressive action, may have resulted not merely in the production in the concrete of new species, but even for a new genus, family or order; that the changes of development in all animals and plants are not carried on by a fortuitous concourse of influences, or by minute hap-hazard variations in all directions, but by a definite system of internal law, aided and influenced in the past as now by the action of incident forces operating according to law, and resulting in due and orderly *specific genesis;* that in the process of evolution we have constant evidence of a Great First Cause, ever and always operating throughout nature in a manner hidden from the eye of sense, but clearly manifested to the intellectual vision; that a belief in evolution, far from leading to a denial of "creation," distinctly affirms it, and that a candid study of merely organic life makes evident the logical need which exists for the Theistic conception.—*Harper's Monthly for July, 1881.*

RELATIONS OF SCIENCE TO SPECULATION.

PRINCIPAL J. W. DAWSON, LL. D.

"Do we really exist? If we do, what is the thing called life?" Such are the problems that were discussed by Principal Dawson, of Montreal, a Fellow of the Royal Society and one of the best living scientists in the study of biology, in his lecture at Association hall, Philadelphia. It was the first of a series of gratuitous Lectures on "The Relations of Natural Science to Monastic and Agnostic Speculations," given under the auspices of the Crozier Theological Seminary.

If we ask, said the lecturer, what is science in relation to nature, we have before us all that men have observed of the workings and objects of nature and the deductions therefrom. But added to this is something of another sort, sometimes called philosophy, which is really a mass of material, the growth of the thoughts of the times, and this is that troublesome commodity—modern speculation. Evolutionists need the less complain of this view, as it is the natural outgrowth of their theory. It by no means follows that our knowledge of recent discoveries equals the extent of their practical application. Take, for instance, electricity. Its application in a variety of ways is almost general, and yet there are very few things we know less about, either as to its laws or by what it is regulated. There is so much discovery that men are in danger of thinking themselves omniscient, but in reality the most of the accomplishments of science remain mysteries to mankind. The tendancy to mad specialties of study, too,

causes a great deal of general speculation, covering the whole field to be made, from a point of view that is really restricted. Then there has sprung up a demand for sensational science just as there has sprung up a demand for sensational fiction, and if it cannot be met by facts in existence, something has to be invented, for the number of half starved scientific men who are trying to find the secrets of nature is by no means small. Moreover a great deal of supposed scientific truth is vague and does not mean one-half what is supposed. I don't know to what extent science is to be blamed, but not a few of those who have pushed speculation to its utmost have been literary men, and some of them had studied theology as well. An agnostic, you know, is literally one who doesn't know. As one of them has expressed the idea, "the existence of a God is unthinkable." The agnostic, while saying less than the atheist, means scientifically more, and steels himself against argument by saying it cannot be reasoned about at all. In the true sense no scientific man can be an agnostic. There are few of us, perhaps, who will refuse to accept the creed, "I exist," although there are some who might limit it, and yet our personal existence is a thing most incomprehensible, especially in regard to its beginning and its ending.

We are in a boundless space and time, with the beginning of either a mystery, so that it is scarcely possible for any one to admit their own existence without arousing a vestige of the religious idea. In personal existence is involved the question whether or not the vastly complex bodily organism is the first or only the outer shell. We cannot but admit that the body is vastly more mysterious since science took it up, There is a class of philosophers who think it will simplify matters to consider the individual as a material substance with two sets of properties. If by a material substance is meant a combination of elements there is no such material in existence having the qualities of mind; if it means the whole being, the statement amounts to nothing. We must admit there is something more, and that is life. Nutrition, reproduction, sensation and voluntary motion are its functions, the last two being restricted to animal life. Herbert Spencer says life is "the continuous adjustment of internal and external relations," but that is very vague and only touches the surface. I think myself that life has the same relation to organisms that force has to matter. It is some energy, whether a combination of physical energies, or the same but correlated only with organization. It is all very well to find fault with calling the living organization "a machine," but a machine has to be made by some one and for a purpose, and there is an enormous lot of theism in the idea. Who ever heard of a machine made by nobody for nothing in particular? What is the use in talking about protoplasm as the basis of life when in point of fact protoplasm depends on life as its basis? All the white of an egg is protoplasm, but life is in the embryo cell. Protoplasm may go to make feathers and flesh and tissue, and yet the life that constitutes the chick may be elsewhere. Going further, science fails to correlate the power of the human will with any physical force. It is an energy that operates only on living organs and through them on other things. Then comes the question, are

we the originators of the world, or did it produce us, or is there a great third Being? If an atom is a vortex, as they say, what is it a vortex of? We talk very learnedly of laws of nature, but they are but the expressions of the controlled motion of things. Behind them lies an insoluble mystery.

In conclusion Mr. Dawson discussed the three theories of Herbert Spencer as to the origin of things "self-existing" or "self-created" or "created by external agency," and raised a laugh by saying that the possibility of creation by an agency within had never occurred to Mr. Spencer. Mr. Dawson's deduction was that science is not inconsistent with the view of a superhuman power as explaining the origin, design and continuance of things.—*Philadelphia Times.*

MEDICINE AND HYGIENE.

COMMON SENSE SANITATION.

THEO. S. CASE, KANSAS CITY.

The difficulty of securing the proper healthfulness of cities and dwellings seems to be that the people have come to regard sanitation a "scientific" matter, to be conceived and projected only by doctors and engineers and to be executed only by expensive and predaceous plumbers, by means of labyrinthine and imperfect pipes and illusory ventilatros, which are prone to perverse and baneful misdirection of their contents.

The idea of "dirt" is obscured and over-slaughed by technical terms like "fever germs," "bacteria," "pollution," "sewer gas," etc, until the ordinary citizen is appalled and led to regard the washing of his face or the cleansing of his cistern as the feeblest and most useless of defenses against enemies so mighty and omnipresent.

When, however, we come to examine the most perfect systems of sanitation for cities, the gigantic developments of sanitary engineering in the metropolitan cities of London, New York, etc., combined with the most modern hygienic improvements in the building of houses and the treatment of the human body, we find that the success of the whole structure depends upon

1. Personal cleanliness.
2. Household cleanliness.
3. Municipal cleanliness.

All the legislation conceivable will be of no service in preserving the health of a city unless the first of these is observed, and it is there that the work should commence.

Free baths, with whatever of compulsion is necessary to make that class of

citizens use them who need them most and which class is most averse to their use, are of the first importance. Bodily cleanliness is the first step toward household neatness, for no clean family will live in a filthy house. It is this feeling, combined with the natural alarm produced by the frightful pictures and objects drawn by sanitary engineers and microscopists, that has led the people of great cities to grasp at any straw that promised relief or escape from the dangers of the specter *unsanitaries*. It has driven them from the common sense measures that would have in most cases answered every purpose, to the transfer of the personal control of their own households to municipal officers whose blundering and jobbery has inflicted great burdens of taxation as well as many physical evils upon them.

The cleansing of dwellings does not depend alone upon the use of water. Dry dirt is preferable to moist and moldy cleanliness. Scrubbing is good sanitation only when followed by thorough drying and ventilation. Dry dirt, even on a kitchen floor, is far more tolerable, hygienically than slops and rotten beams under the floor. Moist and mildewed papers, held to sodden walls by putrid paste, will originate diseases which could have no existence in a dry atmosphere. These evils are not remedied by sewer pipes. On the contrary they are often intensified by the addition of sewer gases escaping from defective joints. The remedy is to properly carry off from the roofs the rain which otherwise permeates the walls, and to put down kitchen floors that are impermeable to water. These precautions, with proper ventilation, will go far to render our dwellings dry and healthful.

To properly cleanse streets and alleys is to remove the filth, not by washing it partially away occasionally with a hose and leaving the remainder to ferment and fester in the sun in the nooks and corners, the interstices between the flags of the gutters, and in the mud of the macadam, but by scraping and sweeping it up and carting it away, by leaving the streets as dry as may be except from the most superficial sprinkling, by removing all slops and garbage from the alleys and using lime and copperas as disinfectants at all offensive localities.

A model street is one composed of a smooth, not slippery, hard material, impermeable to moisture; with its sewers opening into towers high enough to discharge the foul gases above the heads of the people and its dust and accumulations swept or washed away at night.

Much of the pestilence which has decimated Memphis twice within the past few years was due to the condition of her streets, which had been covered with wooden pavements. "These had become much decayed, and readily absorbed much of of the liquid filth that flowed over the rotten gutters, and in due course became so permeated with it that the periodical flushings of rain storms utterly failed to cleanse them and they were the constant source of poisonous emanations."

The disposition of the sewage of a town is the most troublesome question of all, and one that is far from being settled, though millions of dollars have been expended in the large cities of the world, in attempts to solve it. Manifestly the most complete and thorough solution of the matter is to burn the solid portion;

the next is to bury it in the ground, and the last to discharge it through sewers into the nearest water course. The first is the most expensive, though clearly the only perfect destruction of it; the second, though a natural rendering of "earth to earth," will only answer in districts comparatively sparsely settled, while the last is that best adapted to the conveniences of most cities, though by no means satisfactory in a hygienic sense.

In London, after the Thames river had become an intolerable nuisance by reason of its filthiness as a scavenger of the immense city, the removal of the sewage was handed over to the Metropolitan Board of Works. The general plan adopted was that of intercepting sewers, which receive and convey the entire mass to out falls far below the city where it is discharged, twice every twenty-four hours, from immense reservoirs, upon the flood tide and, theoretically at least, borne out to sea. At Edinburgh where the natural facilities for its disposition are far better, the sewage and rainfall are discharged at the conveniently near sea outlet at Portobello. At Glasgow, the sewage is emptied into the Clyde, and later, the foul mud of that stream is dredged up and conveyed in barges to a deep Loch more than twenty-five miles off.

In New York and Boston the most serious trouble has been experienced from the same causes, and gigantic engineering enterprises are being considered and adopted for the relief of the people from the effects of pouring such vast amounts of sewage into the streams and bays near those cities. To show how the presence of such matters affects the health of the localities, where they are exposed, it is only necessary to refer to the case of Glasgow, where the sewage, though deposited in a wide and deep Loch out in the country, has engendered new types of disease and converted one of the healthiest seaside resorts into a pestilential fever center. In this city our only practicable resort is to deliver our sewage into intercepting sewers which shall conduct it to the Missouri river, at a proper distance below the city. Fortunately its rapid current is our sure safeguard against any possible return of it to afflict us with its evils. The main thing to guard against then, is ill-constructed, ill fitting, leaky pipes, through which the deadly sewer gas escapes and, penetrating our houses, poisons our families.

When a respectable householder, in his anxiety to avail himself of every means of making his home pleasant and healthful, connects it with a main sewer he runs a risk beside which exposure to small-pox is a trifle. He places himself at the upper end of a tube, which, if defectively valved and trapped, leads into his house, by natural laws, gases, which, evolved from the outpourings of hospitals, soap factories, slaughter houses, hotels and dwellings, are unutterably foul and malignant. Common sense says, keep such pipes out of your houses, or if you cannot do so in cities, then see to it that the connections are made by conscientious experts who understand the dangers and their prevention, and that the main sewers are fully ventilated, and in such a way as not to force them into our dwellings, nor discharge their offensive effluvia at our prominent street corners in the faces of our wives and children as they pass by.

XUM

London suffers immeasurably from the pent-up sewer gas, which, under its system of collection and storage, inevitably accumulates in the reservoirs and pipes, and pushes its way with overpowering force through almost every obstacle presented by engineers and plumbers, so that the problem of rendering a dwelling house proof against it is one of no easy solution.

Mr. Geo. E. Waring, the well known sanitary engineer, proposes separate conductors or sewers for the removal of the natural or land and surface waters, and for the removal of the artificial or house and soil drainage of cities. He also recommends the system of "pipe drainage" now in use at Memphis, the leading principles being "the restriction of the size of the sewers to a capacity barely sufficient to carry the greatest flow of the day when running half-full; the most complete and thorough ventilation of every part of the sewer; and its thorough washing, from end to end, at least once in twenty-four hours, by a suddenly discharged volume of clean water sufficient to carry forward, at least to a point where the constant flow is sufficient to keep them in motion, all solid substances delivered to the sewer by its tributary house drains, so that nothing of a putrescible character shall remain in the sewer long enough for its decomposition even to begin." This plan has succeeded admirably in Memphis, entirely preventing the formation of sewer gas in the pipes, even in the hottest weather.

In Baltimore all of the rainfall is removed by surface gutters, the experience of the people having demonstrated effectually the importance of retaining it upon the streets for cleansing purposes. The same plan might prove effectual in Kansas City, if our streets were properly paved, since the topography of the two cities is somewhat similar and our spring and summer rains are so copious as to insure perfect cleansing with every shower.

We are then fortunately able to adopt the Memphis plan for our sewers and house drains, and the Baltimore plan for the removal of the clean surface water or rainfall, with the beneficial effect of washing off our streets at the same time.

All this is common sense sanitation, and if such simple plans as these are adopted for the personal, household and municipal cleanliness of our city there need be little fear of pestilence.

INSTINCT AS A GUIDE IN DIETETICS.

"Instinct," as Falstaff says, "is a great matter;" and it is curious and instructive to note how, in the absence of scientific knowledge, it has guided the human race in the selection and preparation of their food as well as such knowledge could have guided them, and in some cases even better. It has sometimes been right when science for the time was wrong, and the latter has eventually had to acknowledge the mistake it had made. It is not many years since the discovery was announced that the bran of wheat had a high nutritive value, and forthwith we were admonished by dietetic reformers that fine wheaten bread was

not an economical food for the workingman. But that unscientific personage had learned to prefer the fine white loaf to the coarse brown one, and declined to be a convert to the new theory. His scientific brother naturally ascribed this to the force of habit or prejudice, and was very severe upon the obstinate wastefulness of the poor in throwing away an important part of their scanty fare. But, as we now know, the instinct that led the workingman to stick to the bread which the experience of many generations had taught him to prefer was right in its choice. The brown bread did, indeed, contain more nutriment than the white, but in the process of digestion the body got more nutriment from the latter than the former, The action of the bran particles on the alimentary canal caused the coarse bread to pass through it too rapidly, and the loss in this way was greater than the gain in the other. Improved processes now furnish us a fine flour in which the old waste of nutritious material is largely prevented; but even under the old methods of milling, the notion that "white bread is the poor man's food" was correct. It was brown bread that was the luxury, suited to the dyspeptic rich man, but too dear for the healthy and hard-working poor. Science was too hasty in its first inferences, and has since learned that the digestibility of food and its aptitude for assimilation must be considered, and not merely its chemical composition.

Equally based upon sound principles is the working man's liking for animal food. Scientific men have demonstrated that vegetable food contains essentially the same nutritive matter, while it is a good deal cheaper. They have explained that the fibrine of flesh has a very close analogy to the gluten of wheat, and is fitted to serve the same purpose in nourishing the body, and so with animal fats and vegetable oils and the other leading constituents of the two kinds of diet; but the poor man nevertheless persists in spending as much of his hard earnings for meat as he can possibly afford. If he cannot have the coveted food every day, he will have it when he can, if only once a week. Recent German investigations prove that this preference for flesh has somewhat the same economical arguments in its favor as that for the fine bread in comparison with the coarse. It has long been known that, as a general rule, flesh is easier of digestion, and is therefore more perfectly assimilated, than bread and other vegetable food. We must consider not merely how much nutriment each puts into the body, but how much of it remains there and how much is rejected as waste. Good authorities have stated that, if equal nutritive quantities of each are eaten, the loss from the vegetable is twice as much as from the animal food; but it would seem from these recent experiments and analyses that the waste of nutriment is often much greater in the case of vegetables.

Professor Hofmann gave to a servant of his 1000 grams of potatoes, 207 grams of lentils, and 40 grams of bread. On an average of six days it was found that 356 grams of the solid matter were digested, 116 remaining undigested; 38.7 of nitrogenous matter had been digested, 44.4 undigested; 263.7 of starch digested, and 28.2 not. It would here appear that not even one-half of the total albuminous matter of this vegetable diet had been digested.

XUM

The same man was then given 390 grams of lean beef daily, 126 of pure fat, and 40 grams of flour. The result was that 221.8 grams of solid matter were digested, 33.6 undigested; 73 of albuminous matter were digested, and 16.9 undigested; 121.1 of fat were digested, and 4.9 undigested. Here the animal food was shown to be much more digestible than the vegetable.

Dr. C. Meineret, in a recent treatise, gives the loss of nitrogen in solid excreta expressed in percentages of the total nitrogen contained in various substances. In meat that loss he found to be only 2.6; in egg 2.6; in milk and cheese together, 2.9 to 4 9; in milk alone, 7; in macaroni, 17.1; in peas, 27.8; in black bread, 32; in potatoes, 32; in carrots, 39; in lentils, potatoes and bread taken together, 47; in lentils, 40.2; in celery, cabbage, and carrots, 21; in Horsford-Liebig's bread, 32.40; in rye bread, 22.2; in very black (or brown) bread, 42.3; in white wheaten bread, 19.9; in mixed food with meat (fourteen days), 18 to 12. White bread, it will be noticed, is far more digestible than brown bread.

Rubner took 1172 and 1435 grams of meat daily (more than 2 lbs.), and yet all the albuminous matter except 2.5 per cent. was digested; and when 21 eggs were taken daily, 2.9 per cent. alone of the albumen was undigested. Flügge took daily one liter of milk, 500 grams of meat, 150 grams of wheaten bread, and 68 grams of butter, and found that 94 per cent. of the nitrogen was absorbed, and 95 per cent. of the fat. When he took a diet chiefly vegetable, he had only 85.3 per cent. of the nitrogen absorbed, and 88.7 per cent. of the fat.

The results of these experiments by independent investigators evidently agree in proving that a much larger fraction of nutriment is utilized in the case of the animal than in that of the vegetable food. They go far toward knocking away the very foundations of vegetarianism by showing that our digestive apparatus is better adapted to deal with the former than the latter; and they strongly confirm the teachings of an instinct of the race on this subject.—*Boston Journal of Chemistry.*

CHEMISTRY.

ATMOSPHERIC OZONE.

PROF. G. H. FAILYER, MANHATTAN, KANSAS.

A favorite study, which has suddenly come to naught, is upon the occurrence of ozone in the atmosphere. Much painstaking labor has been expended in noting the variations of ozone in the air between day and night, different seasons, climates, and sections. An incentive to these labors existed in the supposed relation of ozone to vegetable nutrition and to the health of man. Ozone, being an energetic oxidizer, would form assimilable compounds of nitrogen, to nourish

plants; and if plants emit ozone, as is believed by some agricultural chemists, they would have within themselves the power to partially supply the nitrogen which they require. The large leafed plants, according to this view, should be better able to supply themselves with these needed compounds; and, seemingly to substantiate this view, it has been observed in agricultural practice that these same plants, with massive foliage, although they contain a larger amount of nitrogen, do not impoverish the soil as do the fine-leafed cereals. Further, the presence in the atmosphere of such a vigorous oxidizing agent would destroy such organic matters as prevade the air; and epidemic diseases would be rarer, in proportion as the ozone increased in the air. But, being irrespirable from its great activity, throat diseases would proportionately increase.

These considerations were sufficient to direct the greatest attention to atmospheric conditions in this respect. The usual test for ozone in the air has been the well-known iodide-of-potassium starch-papers. The ozone oxidizes the potassium and sets free the iodine, which then reacts upon the starch, giving a blue which varies in intensity with the proportion of ozone present. This color is compared with a scale of varying tints, and the corresponding number read off. It was known that other substances, such as nitrous acid and hydric-peroxide, have the power to thus react with this test; and that ozone would act only in the presence of moisture. The influence of the latter seems not to have been given its true importance. The former objection was met by the fact that peroxide of hydrogen was not known to exist in the air, even in minute quantity; and it was supposed to have been demonstrated that it gives the reaction only when concentrated. The papers were blued under conditions when it could not have been due to nitrous acid. But later and more satisfactory investigations have shown that hydric superoxide does exist in the air, and that in sufficient quantity to react with the above test. The reliability of this test for estimating any oxidizing principle in the atmosphere, has been shown by observing that the hygroscopic character of the paper used, although the same formula be followed in preparing the reagent, so far influences the reaction that test papers from different sources, exposed together, give widely different results. The results with the same paper vary with the humidity, and seem to have little other value than is possessed in common by crude chemical hygrometers. Nor are the other tests which have hitherto been trusted, decisive between ozone and these other oxidizers. So that the existence of ozone as a usual constituent of the atmosphere, has been rendered quite problematical. Thallium papers, however, are not influenced by moisture, and seem to furnish a reliable means of estimating the oxidizing principle present in the air; and it seems, in general, to be peroxide of hydrogen.

Do these uncertainties regarding the existence of ozone in the atmosphere, overthrow all the conclusions drawn from its supposed abundance? Does the untrustworthiness of the conclusions based upon carefully conducted experiments show the folly of trusting scientific "facts" and of accepting the theories founded upon them? To the latter the answer is an emphatic no; to the former, in one

sense, it may be, yes; in another, it must be, no. In the first place, while the proportion of the oxidizing agent, as determined by the iodide-of potassium-starch-papers, is of no value whatever, and we do not know that ozone is ever found in the mass of the atmosphere, the existence of some oxidizing agent is not, and cannot be, questioned. And, whether the action upon the thallium or other test papers be due to one or several of these agents, from a practical standpoint would not seem to be so important as the fact that the oxidizers exist, and do purify the air by consuming the effluvia and other noxious substances that find their way into it. Nor are we to lose faith in the conclusions and theories of scientists because occasionally these conclusions are based upon inadequate knowledge.

The scientific mind of the world is the embodiment of the known facts of nature. When a series of facts, learned by observation or experiment, show the same thing, this scientific opinion is in accordance with them. When it is learned that other principles are involved than those previously known, without a protest, this opinion is founded upon the new facts. While a few scientific men, from association, find it difficult to give up long cherished views, no class of men are so little dogmatic as they. Even the same individuals may hold tenaciously to other faiths, whether political, religious, or socialistic, while in natural science he adjusts his belief in accordance with the light he has.

We claim it as the chief reason for trusting scientific opinion, that a vast corps of trained workers are constantly testing from every point of view the various principles upon which all theories and rules of action are based; and so soon as a single fact inconsistent with an accepted principle is found, the principle and all views and practices due to it, are discarded.

The question of the existence or non existence of ozone in the atmosphere, which just now is in doubt because of the lack of proper tests, was previously answered in the affirmative; and the answer was a purely chemical one, involving chemical reactions. And yet no one will doubt that pure chemistry gives to man the most trustworthy evidence in his possession.—*The Industrialist.*

ASTRONOMY.

ASTRONOMICAL NOTES FOR JULY, 1881.

BY W. W. ALEXANDER, KANSAS CITY.

MERCURY, from the 1st to the 17th, will be among the stars in Cancer, and the remainder of the month in Gemini. There will be no favorable time this month for observing it. On the 17th it is in inferior conjunction with the sun.

VENUS will be in a favorable position during the entire month for observation. On the 12th it reaches its greatest elongation west from the sun, 45° 44′.

At that time, if observed with a good telescope, it will appear in the same form as the Moon does at first or last quarters, the terminator being straight and cutting the disk into equal semi-circles. For the month it will be in the constellation Taurus. On the morning of the 13th a line drawn from Aldebaran to the Pleiades will pass through this planet, it being near Hind's variable nebula. On the 30th it will be in the Milky Way, near Chacornac's variable nebula. It is receding from the earth during the entire month, its apparent diameter on 1st being 72″ and on the 31st 20″.

MARS, from the 1st to the 23d, will be in Aries, and the rest of the month in Taurus. On the 6th it is in conjunction with Saturn, being north 1° 5′. On the 14th it is 33′ north of Neptune. On the morning of the 22d it will be in close conjunction with Jupiter, being only 7′ or a little less than one-fourth the apparent diameter of the Moon, south of that planet. Its apparent diameter is slowly increasing, being 6.64″ on the 1st and 7.35″ on the 31st. It rises a little after midnight.

JUPITER, with its four satellites, will adorn the eastern sky, rising about 5 hours before the Sun. It will be in the constellation Aries. Its apparent Right Ascension on the 1st is 3 hours 4 minutes, and on the 31st 3 hours 23 minutes. Its apparent diameter is 34″ on the 1st, and 37″ on the 31st. The satellites present but few phenomena of interest, except on the morning of the 16th, when the third will disappear in eclipse at 2 hours, 33 minutes, 55 seconds.

SATURN rises about midnight—a little before Jupiter. Its position is favorable for morning observers. The Earth on the 18th is elevated above the plane of the southern surface of its ring 20°. This remarkable planet is at a mean distance of 872,135,000 miles from the sun. It performs a revolution around that orb in 10759.2 mean solar days. Its volume is 746.9 times that of the earth. This planet, belted like Jupiter, is surrounded not only by eight moons, but by a succession of rings that extend out in the plane of its equator 83,000 miles, the inner one being transparent. The equator of this planet, unlike that of Jupiter, is inclined 26° 48′ to the ecliptic; hence transits, eclipses and occultations of its satellites, the orbits of which for the most part lie in the plane of the equator, occur but rarely. It is the rings that form the most attractive part of this planet's phenomena. We may imagine how much earlier observers (with their imperfect telescopes) were puzzled by these strange appendages. It was at first supposed to resemble a vase, so the name of Ansæ, or handles, were given to the rings in certain positions by many observers. By some it was supposed to consist of three bodies, the larger one in the middle. The true nature of the ring was first discovered by Huyghens, in 1655. Nothing in the history of astronomy is more encouraging than the way in which eye and mind have spanned the tremendous distance which separates us from this planet. The fact that the appearance was caused by a ring was first determined by Huyghens; then a separation dividing the ring into two was observed. The extreme thinness of the rings was noted by Sir William Herschel, when he saw the satellites like pearls on a silver thread.

An American astronomer finally ascertained that the number of the rings must be increased many fold. Next followed the discovery of the transparent ring in 1852. Then this ring was found to be multiple. It is now known that the divisions in the various rings are subject to change, and that the whole system is probably increasing in breadth and approaching the planet. Of what, then, are these rings composed? The more plausible theory is that they are composed of myriads of satellites or small bodies, moving each in its own orbit round the planet, causing the appearance of a bright ring where they are close together, and a faint one where more scattered. This theory accounts for the varying brightness of its different parts, and its haziness near the planet.

URANUS will be in the constellation Leo. On the 18th it is 12° 30′ east and 4° 30′ south of Regulus, the brightest star in this constellation. Its apparent diameter on the 1st is 3.58″ and on the 31st 3.50″.

NEPTUNE on the 15th will be in the constellation Aries, in Right Ascension 2 hours 57 minutes, and Declination 15° 1′ north.. This position is nearly correct for the entire month.

THE MOON on the 1st will be in conjunction with Uranus. On the morning of the 20th it will pass north of Jupiter, Mars and Neptune, about 3° 30′.

CABLING OF ASTRONOMICAL INTELLIGENCE.

The question of transmission of astronomical announcements and intelligence has recently caused a considerable amount of discussion among European astronomical societies, the members of which had come to the conclusion that the system formerly in use was unreliable and the cause of much trouble to the possessors of large telescopes, which require tolerably exact positions to easily obtain good results. So much trouble has there been on this account, that the possessors of large instrumeuts, as a rule, do not care to attempt to observe comets unless a finding ephemeris can be prepared for their use, and to facilitate their observations, it has been the custom for some time, in Germany, England and this country, to circulate these data by mail so soon as they can be prepared.

It has often so happened that the prevalence of storms, or the immediate following of the discovery of the comet by a bright and increasing moonlight, has caused the total loss of a comet, so far as observations are concerned, while confusion and annoyance were of quite frequent occurrence.

With the idea of adopting a system of announcement of astronomical discovery and data, which should be as free as possible from error of any kind, a correspondence was last year maintained among European astronomers, and a system was decided upon which seemed reasonably free from possible error. By this system the name of the discoverer of a comet, date, position of it, and motion, were to be comprised in a cable message of sixteen or eighteen words. Nothing was attempted in the way of transmitting further intelligence, and the liability of

there being no observation of a comet throughout an entire continent was still very possible.

To obviate this difficulty, Messrs. S. C. Chandler, jr., and John Ritchie, jr., of the *Boston Scientific Society*, have adapted a telegraphic code to the needs of astronomy, and a first test of this code has just been made over the Atlantic cable. The entire elements and ephemeris covering sixteen days have been successfully sent across the ocean—those data computed at Boston being sent to the private observatory of Lord Crawford, at Dun Echt, Scotland, and those computed at Dun Echt have been successfully sent to Boston; Boston and Dun Echt being respectively the comet circular centres of the United States and England respectively.

The positions on which the Boston elements were based covered the unusually short period of three days; and had one of these positions been doubtful, or had the storm which has just passed across the country been but an hour earlier in reaching Portland, Me., where the American position of May 5th was obtained, the probabilities are that from American data alone an ephemeris could not have been issued for more than a week after the time that it was actually circulated—a considerable loss in the matter of actual observation Had this happened, American astronomers could have depended upon European data, which were published in a Special Circular of the *Science Observer* but a day later than their own Boston calculations, and the same adverse circumstances that have a number of times caused such trouble and disappointment, would have had no effect.

The system adapted by Messrs. Chandler and Ritchie is more complete in the data given, self-checking and less liable to error, and a complete set of elements, together with an ephemeris of four dates, together with the light curve, are comprised in a message of *sixteen* words. By the same system the telegraph announcement can be made of the discovery of a comet in only seven words, in place of sixteen by the system now in use, and should two of these seven words be absolutely lost, there would still be sufficient data to render the finding of the comet no more difficult than it now is in general with the data given by the sixteen words of the system now in use.

The successful result of the experiments with this code may be considered as a long step onward in practical astronomy.

An Alabama man announces that he does not believe the world rotates. He says: "When two objects pass each other, going in opposite directions, they pass very quickly, as, for instance, a bird flying west ought to pass objects upon the earth much more rapidly than when it flies east. But this is not the case. A bird passes no more rapidly going west than when it flies east; a ball thrown against a house in a westerly direction does not rebound any more than when thrown east. You may send a balloon up above your head and let it stand twenty-four hours, and at the expiration of the twenty-four hours the balloon will be directly over your head. I have studied the reasons given in astronomy, and find nothing to refute my observations."

XUM

METEOROLOGY.

A REMARKABLE SPELL OF WEATHER—JUNE 9TH TO 12TH, 1881.

The storms of June 9th to 12th, 1881, were so severe and widespread through the West that we have deemed it worth while to record them, merely as a matter of history, leaving the meteorologists to work up the causes and the laws that produced and directed them.—[ED.

THURSDAY, JUNE 9TH.

An unusually severe hail and wind storm occurred in the vicinity of Solomon City, in Dickinson county, on the Kansas Division of the Union Pacific Railroad. Hailstones fell in great quantities and of large size, some of them measuring ten inches in circumference. The storm extended over a strip of fine farming country, about four miles wide aud six long, the direction being from the northwest to the southeast in this district. A correspondent at Solomon City furnishes the following account of the storm: "At about 4 o'clock in the afternoon the clouds began to gather in the north and west, and to circle about and take on changing positions rapidly. At half past 4 a small sharp point was seen to drop down slowly three miles northwest of here till it struck the ground, and the column continued sinking till at the base in contact with the earth it measured something like forty rods across, and widening gradually into a most magnificent inverted cone, started slowly, moving to the north and east, and was watched with intense interest from this point till it passed out of sight. At 6 o'clock the wind began to change here in a most fitful manner, blowing a gale from every point of the compas within the space of ten minutes. Then great chunks of ice began to fall with a force that was more fearful than can be described, crushing through windows, cutting the leaves and small branches from the trees and pounding the crops into the ground. No one who witnessed ever saw or heard anything that equaled it.

There were two or three different storm clouds of more or less power, some of them moving in one direction and some in another, but the main one, the one which claimed for its own everything within the scope of its size, took northeasterly for its general direction. The storm commenced at a point a few miles north of Salina and from the first everything it touched was doomed. Moving on, sometimes with steady stride, it would cut a clean swath, and anon it would leap up and forward and a space would be left entirely undamaged. Then again it would strike the earth with redoubled fury, tearing up the very ground in its insatiate greed of spoil. One gentleman lost a reaper and can find no trace of it; another had a new header taken off and not a vestige of it has been found up to this time. Machinery of every description standing in the fields was broken and twisted till worthless, and entire fields of grain were taken, leaving the ground as

clean and bare as though just plowed and rolled. Striking the Solomon river at a point about four miles west of here, it left indelible traces of its visit. Huge trees of every variety were torn and twisted as though they were but saplings, and the limbs strewn for more than half a mile over the prairie, while the greater portion of them were denuded of bark as entirely as though stripped with a woodman's ax. One elm, noticed especially, was torn from its hold upon the earth and carried from its position nearly twenty yards, while some of its limbs were found over a quarter of a mile distant. The tree measured two and one-half feet through, and the spread of its roots, as it lay prone upon the ground, was ten feet. The cavity left where it had stood would have buried a fair sized house. Other immense trees were torn from the bank and hurled into the river, while one and all were broken as easily as though formed from potter's clay. Mud was scattered in profusion over the course of its track and thrown against stumps of trees with such force as to pack it as though pressed by powerful machinery.

About eighty rods from the river stood a strong log house, owned by Mr. Peter Sullivan. He had the misfortune last Sabbath to have a team run away with him, thereby receiving a fractured leg. He was lying in bed in his house and a number of friends had called upon him, so that eight persons were congregated in the house at the time of the storm. The place was not in the direct line marked out for destruction, but was, so to speak, a side issue. The house was built of hewn logs, a story and a half in height. The logs were about twenty-five feet in length, one and one half feet wide and about ten inches thick. They were dovetailed together at the end, and it seemed as though the house might stand for ages, but one breath of the monster razed it to the ground, or more properly speaking, to the floor, and I saw one of the logs forty yards from the house. Nothing but the floor and one or two logs remained to mark the place where once it stood; but the strangest part of the story is, that not one of the eight persons in the house at the time was injured in the least. It stripped the bed, on which Mr. Sullivan was lying, of its clothing, but did him no injury. About a quarter of a mile from Mr. Sullivan's stood a small house, occupied by Dennis, or as he is more familiarly known here, Dennie Morgan and his sister; a small boy also lived here with them. It seems that they saw the storm approaching, and were about to enter the cellar for safety. The boy reached it, but the others did not. Miss Morgan was found about fifty yards from the house, and he one hundred and fifty. Every bone in their bodies appeared to be broken. The boy in the cellar was uninjured. The house was carried bodily 100 yards, and strewn in a strip from ten to fifteen feet in width for 150 yards, in a semi-circular form. The shape of the circle would indicate that the whirling demon was in the vicinity of 400 yards in diameter, and that Mr. Morgan's house had been about half way between the vortex and the outer circle. A peach orchard belonging to him was completely uprooted, the roots and branches separated, the branches carried entirely away and the roots scattered in profusion over the face of the country. A few of them were seen over a mile away. Several other houses in this vicinity

were demolished, but no one living in them was injured, though many had narrow escapes. Eastward from here the path of the tornado is marked by destroyed wheat fields, paths cut through hedges and fences and other similar marks peculiar to these depredators. After this fiend had completed his work, as though not satisfied that its work was complete, a hail storm, the like of which has never before been seen here, visited a section with a radius of about three miles each way from here, ruining thousands of acres of wheat. The corn, though stripped of its blades, will probably recover. Trees were much damaged by it and grass and weeds were driven into the ground. In this town there is hardly a whole pane of glass in the north side of buildings unprotected by porches or blinds, and in many cases whole sashes were broken out. The houses are marked and bruised as though struck by hammers.

One gentleman picked up a piece of ice which had fallen, two inches in thickness and two and one-half in length. It is claimed that one was found measuring thirteen inches in circumference, while a party well known states that he measured one which was nine inches in circumference and weighed one and one-quarter pounds. A large number were found which measured from four to six inches, and from the marks on the ground a great portion must have been at least two inches.

The whole theme of conversation here now is the "cyclone." One hears it in the hotel and on the street corners, and some are almost afraid to stay in the town for fear of a repetition of the elemental war. Eight years ago the section between Salina and Bavaria was visited by something similar to this, but nothing like the destruction of property occurred. The funnel-shaped clouds which are peculiar to this kind of storm were smaller but more numerous, aud at that time seven distinct columns were counted in the distance. The people will long remember the 9th day of June, 1881, as a day when the elements conspired to destroy with one breath the work of years."

Further reports of the storm state that the tornado extended into the eastern part of Lyon county, and did great damage to the crops, fences and buildings all over that part of the country. The little town of Americus, near Emporia, is seriously damaged. The United Presbyterian Church, which was of brick—the principle church structure of the place—was literally blown to pieces and scattered for miles around. The Methodist Church, a large and beautiful frame building that had recently been fitted and furnished, was blown off its foundation and almost totally destroyed. In Emporia the storm was not so severe, though many houses and fences were blown down. The north and east addition of the State Normal School building, which had just been finished to take the place of one destroyed by fire two years ago, was unroofed, the walls partially torn down, and the building otherwise damaged. A fine rain accompanied the tornado.

Fuller reports were received from the scene of Thursday night's tornado in Dickinson and Ottawa counties. The work of destruction commenced about six miles north of Salina, where the house of Frank Phillips was destroyed. Within

ten miles of Topeka the first pointer touched the ground, and the house of John Powell was scattered far and wide. The storm then swept down and licked up the dwelling of W. L. Frothingham. This house was a frame 25x35 feet, having two sheds attached. The twister lifted the structure from its foundation, Mr. Frothingham, his wife and cousin being in the sitting-room at the time, and carried it sixteen feet from the ground down into the valley one hundred and fifty yards, and dashed it into splinters on the projecting rocks. George Combs' body was found something over fifty yards from the place where the house stood, with a fence stake driven through the back of his head, and that of Mr. Frothingham about one hundred yards away, the back of his head crushed in, his left leg crushed, his back broken and his scalp cut at the top of the forehead, and peeled off clean to the back of the neck. His wife was among the shattered ruins, one hundred and fifty yards away, her left arm fractured, skull crushed, and jaw dislocated.

The other ruins were the house of Mr. McIntire, one mile east of Topeka; the house and barn of Mr. Davis, one-half mile further on, and the residence of George C. Parker, from which Lester Parker and Miss Nellie Foote barely escaped with their lives.

The next work of the cyclone was the destroying of the house of Mr. Keane, seven miles east, where the devastation and destruction of property was the most complete. Houses, barns, out-houses and farming machinery of every description were torn to pieces in a way to defy description. The monster took up two horses belonging to Mr. Keane and carried them over the Solomon River, a distance of one hundred and twenty-five feet, and landed them safe and sound on the opposite bank. It also carried a Randolph header weighing 250 pounds into the air some distance; thence passing south by east a distance of five miles. The house of Peter Sullivan was taken at this time.

John Cleyton was the next victim of the fury. His place is two miles north of Solomon City. His buildings were entirely demolished, his sheep and one horse killed, and his crops totally destroyed.

After leaving Cleyton's the twister seems to have spent its fury to a great extent. The last of its work was found on the northeast part of Solomon City, where it did considerable damage in a small way to out-houses. A wagon house was unroofed and the wagons raised and left hanging on the top of the two posts twelve feet high. Chickens were divested of their feathers and many of them killed in the eastern part of Solomon City. A large hay press, weighing 6,500 pounds, was raised into the air several feet and deposited upside down. The damage to growing crops was very great.

FRIDAY, JUNE 10TH.

A terrific rain storm, accompanied by hail, wind, thunder and lightning, visited Eldorado, Kansas, June 10th. The electric display was grand. At one time the clouds that hung over the eastern horizon seemed to be bordered with a fringe of blue and yellow fire. Many people thought that a cyclone was coming, but

happily no great damage was done. Corn was flattened to the earth, wheat was blown down and some small buildings overturned.

The severest and most destructive wind and rain storm of the year visited Topeka at the same time. Several small buildings and hundreds of shade trees were blown down, thus resulting in damage estimated at from $1,000 to $1,500.

SATURDAY, JUNE 11th.

Details of the cyclone which passed near Des Moines, Iowa, Saturday evening give the damage as most extensive, and increase the loss of life. It first appeared about six miles east of the city, moving southwest to northeast, in a funnel shape, with fearful velocity and terrific noise. It struck the earth at McGriff's orchard, about five and a half miles south of the city, and went northeast to Wm. Carfield's farm, completely demolishing his new house. Mrs. Carfield was somewhat injured, although not seriously. One hundred bearing fruit trees were blown down by the storm.

The next farm struck was that of John Hayes, the cyclone going cornerwise through his large orchard, destroying 350 or 400 fruit trees. His large barn was completely blown from its foundation and destroyed. Two horses in the stable remained on the floor unharmed. A one-story tenement house 100 yards from the barn was entirely demolished. Parts of a wagon standing near the barn were scattered in different directions. The wagon bed was found a quarter of a mile distant in a slough, and the front part of the gearing was found in a pile of torn up trees some distance off. It is also said that a pump standing in the well near the barn was taken entirely from the place.

The cloud lifted and next swooped down in Camp and Four Miles Township east of the city, totally demolishing the house of Mrs. Johnson, scattering the debris in every direction; thence northeast to the house of Henry Lamb, which was destroyed. Next a barn of John Creerens; next the house of a Swede named Erickson, who was killed by the falling timbers, his skull being crushed in by a heavy beam. The body was blown some distance from the house and carried with cornstalks which had been set on fire by the lightning, and when found the body was badly burned and the brains were oozing from an ugly hole in his head. His wife was so badly injured by the falling timbers that her recovery is considered doubtful, and their little child was lifted in the air and carried a quarter of a mile, where the little unfortunate was found lying in a field so badly injured that its recovery is despaired of.

The next house struck was the residence of Mr. John Walters, two and a half miles west of Rising Sun. The house was torn to pieces, and his little child was killed by the falling timber. Others were more or less injured, whose names could not be learned.

In Camp Township the house of B. F. Peters was blown down, on the Bodwell farm, in which his nephew and family had sought safety in the cellar. The house was blown off the foundation and completely demolished. No injury done to any of the family. Mrs. Snellson's house was blown down and the contents ut-

terly destroyed. Mrs. Barnard's house, occupied by Dick Horton, was completely destroyed. The barn of Wm. Well was blown down, and his house moved. The kitchen of Mr. Thomas' house was blown down and destroyed.

The cloud then lifted again and next swooped down at Colfax, twenty-six miles east. Weser's house, in the east part of town, was blown down, and two houses out of the city occupied by farmers named Shelden, shared the same fate. A house in the east part of the village was lifted from its foundation and riddled, but the family escaped injury by taking refuge in the cellar.

The house of J. R. Stuble was badly damaged, and that of Mrs. Kinsell was unroofed, and the barn of the adjoining house lifted from its foundation and torn to atoms. A. E. Robbins' house was lifted from its foundation and turned upon its end, and Jos. Berkhard's house is in ruins. The two-story house of W. H. Robinson was completely demolished, numberless barns and outhouses were destroyed, and trees torn up in the track of the storm. Five miles west of town and directly south of Mitchellville four farm houses were destroyed by waterspouts. South of Colfax five miles the fury of the storm nearly equaled that in town. Fences were destroyed, fields laid waste, cattle killed, and several persons injured.

Sunday evening a terrific storm of lightning, wind, and rain passed over nearly the track of the cyclone in this city. The Baptist Church, several residences, and other buildings were struck by lightning, but no persons killed. Trees were badly demolished. In the country farm barns and houses and trees were torn down. At Colfax several small buildings were unroofed, windows broken, and trees uprooted. People all fled to their cellars for safety, expecting a repetition of the cyclone. The path of the cyclone was not wide, but it is marked by complete devastation.

Later reports of the storm show that it came down from Minnesota, following the Des Moines Valley through the State and swinging to southwest in Missouri. Along its whole track there is great destruction of property from wind and hail. Farm houses were destroyed, grain broken down, fruit trees destroyed. In Audubon County two men were killed by lightning. The loss will amount to hundreds of thousands.

The Galveston *News*' Waco special of June 13th, says: A fearful hail storm visited South McLennan and the north part of Bell Counties Saturday night. A number of farm houses were torn down. One lady was killed. Two men were badly hurt. Near Crawford several houses were unroofed. A Dallas special says a violent wind and rain storm swept over the city May 12th. The rain fell in torrents, flushing all the streams. Trinity River rose rapidly, and was expected to overflow its banks. The *News*' special reports wind, rain and hail storms in various portions of the State, in many instances totally destroying the fruit and seriously injuring the corn, cotton and wheat crops. The *News*' Taylor special says a hurricane visited Taylor Saturday evening and lasted forty minutes. No lives were lost. Mr. B. N. Train's house was blown down. Two families sustained serious injuries. The Christian Church was blown from its foundation.

XUM

The Catholic Church and Odd Fellows' Hall were totally wrecked. Nearly all the barns and outhouses were demolished. Scarcely a house in the town escaped damage. The fences were blown down and trees uprooted for miles around.

A Wells, Minnesota, dispatch of June 13th, says: A heavy wind and rain storm passed over this section Saturday afternoon between 5 and 6 o'clock, the storm from the east and west meeting between Easton and Delavan, going in a northeasterly direction from three to five miles with the fury of a hurricane, carrying death and destruction in its path. An old couple named Chaffee were killed and their building blown to pieces. John R. Evans had his house and barn wrecked. L. P. Roberts' barn was wrecked and his daughter severely injured. Reports continue to arrive, and show the storm to have been very destructive, seven or eight houses and barns having been wrecked and a number of people injured.

A Blue Earth, Minnesota, special says: The most violent storm that ever visited this section commenced at about 4 o'clock Saturday evening. Five inches of water fell in one hour. Trees were uprooted and buildings demolished, but no great damage to crops by hail is reported. Mr. and Mrs. Chaffee, living in the town of Lura, were killed by the blowing down of their house. The barn of J. L. Praber in the same town was unroofed, burying his daughter in the ruins. She was taken out in an unconscious condition, and the injuries may prove fatal.

A Chicago dispatch of June 11th, says: Early this evening a heavy thunder storm, rccompanied by torrents of rain and some wind, struck a section above St. Paul and extended south as far as Omaha, causing considerable prostration of wires and obstruction of telegraph in its course. About 9 o'clock another storm burst in the same locality. In neither case did the injury extend far east of St. Paul. It is impossible at this hour to learn whether any great damage was done. Probably the storm was only temporarily troublesome.

Cherryvale, Kansas, was visited on Saturday night by a young cyclone, damaging some property, particularly the open house, which was lately completed, moving it off the foundation a few inches and wrenching one corner. Some dwellings were blown off their foundations, but no one was hurt.

The southwestern part of Missouri seems to have been visited by the same storm that ravaged parts of Kansas Saturday. The wind was not severe, but an immense amount of rain and hail fell over a large area of country, and did great damage to the crops and window glass. A water spout broke in a little valley in Barry county, in which is situated the town of Seven Star Springs, and before the people could reach the surrounding hills, a torrent of water rushed down, taking with it houses, tents, household goods and animals belonging to those living near the Springs. A woman and five small children, and a man and two women and two children were swept away by the flood, but fortunately they all lodged in bushes and were rescued some hours after.

A heavy rain storm, accompanied by hail, visited Jefferson City the same evening. The hail was small, and did but little damage, while the rain was greatly

needed, as fruits and grain have already suffered considerably from drouth.

The same night the vicinity of Joplin was visited by a heavy wind and rain storm, accompanied by severe lightning. Some buildings were struck, but not much damage was done. The weather is very warm. The thermometer marks 100° in the shade.

Saturday afternoon at about 7 o'clock a rain storm blew over this (Kansas) city, drenching everything with a heavy fall, which continued for probably a half hour, when the drops suddenly ceased to fall and the sky was brilliantly illuminated by a rainbow, lasting a few minutes. The sky then darkened and the wind began blowing in fitful gusts, which soon gave way to a terrific gale, with frequent showers, accompanied by heavy peals of thunder and vivid flashes of lightning, approximating the proportions of a full grown cyclone about 8 o'clock, which swept over the city with full force, tearing up numerous trees, loosening a number of signs and doing other damage of minor importance.

The storm came from a southwesterly direction, and seemed to spend its fury of wind and rain in West Kansas, partly demolishing the large five-story hotel building belonging to Colonel Blossom, which fell with a crash, making a ruin of Jarboe's foundry next door, and seriously injuring a young woman bearing the name of Lillie Sedler. A number of skiffs and dredge boats, etc., along the river were torn from their fastenings and drifted down the stream. A building occupied by a saloonist on Missouri avenue was unroofed. Fences and trees along the bluff suffered considerably.

SUNDAY, JUNE 12TH.

The most destructive cyclone that has ever visited Kansas passed over a portion of this country Sunday afternoon, striking the county at a point seven miles east of Winfield. It pursued its course in an almost easterly direction about eight miles. In width it varied from one-half to one and one-half miles. There was very little rain, it being a wind storm or tornado, in which the air was very heavily charged with electricity. Nothing seemed to offer any resistance to the course of the tornado. Trees were uprooted, houses blown down and the timbers scattered for miles in the surrounding country. Houses of the most durable kind were laid low, a stone structure faring no better than the ordinary box frame building. In some instances valuable orchards were entirely destroyed. Not content with larger game the storm searched low down and played sad havoc with small fruit and vines. Floral, a small place ten miles northeast of Winfield, was destroyed. From twenty to thirty buildings within a distance of two miles or so were completely demolished. A large two-story stone store building at the center and a stone residence near by were tumbled down as if by an earthquake. A frame church, schoolhouse and several dwellings were dashed to pieces, and the timbers scattered like straw, the foundations being left clean. Farm houses for a long distance each way were leveled to the ground, and the contents scattered far and wide. Several persons were injured, a few dangerously, but none killed. A cyclone visited Sumner and Sedgwick counties Sunday night, causing the destruction of a vast amount of property and killing a few and wounding other persons.

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It was first seen near Nineveh, on the Arkansas river, three miles from Mulvane Junction, and traveled rapidly in a northeast direction, striking a corn-field near Mulvane. It passed within a mile of Mulvane, and picking up a frame house turned it over twice and smashed it to smithereens. The sewing machine and stove were broken into little pieces; a lady and her child were seriously injured internally, as well as bruised, and the chances are that she will die. The residence of a man named Egan, 20x35, was demolished. This was done by one branch of the cyclone, or water-spout, and another did much damage at Belle Plain. The two united near Mulvane, and it was the two combined that did the work. During the destruction hail-stones as large as a sugar-bowl fell in immense quantities and a hot wind prevailed, making it hard to breathe, and turning the leaves of the corn black. After leaving Mulvane the cyclone wheeled off in a southeasterly direction and struck Flora.

The locality of Osage City, Kas., was visited by a terrible storm yesterday afternoon about 4 o'clock. It was formed near Olivet, in the southern part of the county. The shape and outlines of the cloud were well defined; it was very dark, and apparently hollow. The following is from the account of the *Free Press* extra, issued to-day: Just before it reached the house of a farmer named Powell, ten miles northeast of Olivet, he called to the family to go into the cellar, but they expected it to pass by. Yet, just as it was about to pass, it turned like a mad man, caught the house up whirled it around in the air, and threw it back upon its foundation with great violence, leaving it a pile of ruins. The cellar was filled with the debris, and the family of five people crawled and crouched in a corner, and escaped with a few immaterial bruises and scratches.

A horse was lifted out of the stable and carried over a high hill and dashed upon the ground in a corn field, a mile away. Cattle were lifted from the ground, carried into the air and dashed to pieces. Mr. Powell's fine orchard was totally destroyed, the trees being literally torn out of the ground or twisted into a thousand fragments. Miss Tweed, at Powell's, found the works of her gold watch a quarter of a mile from the house. Their furniture was all destroyed; their bed-clothes and wearing apparel have entirely disappeared, nothing but a few sheets being left. Miss Tweed's clothing was torn off, her trunk was lifted out of the house and was carried off, and has not yet been found. From this point the storm moved a little northeasterly, going about one mile north for every three miles east. Mrs. Freeman, a widow lady living near Olivet, lost her house and everything in it. Plaunty's farm house and buildings were left in ruins. Three negro children left at home near Olivet were badly injured, one having since died, and it is thought the other cannot live.

A severe cyclone passed over Quenemo, Kas., Sunday about 5 o'clock p. m. At Malvern, eight miles northwest of here, one man was killed and one severely hurt. Some six or eight houses were completely demolished and many persons more or less injured. Five miles southwest of this place two children were killed and one man probably fatally injured and many others hurt. In this village and within five miles there are some twelve houses completely ruined and many more

partly blown down. The cyclone seemed to commence on the Marias de Cygnes, west of Malvern, and went in an northeasterly direction, and extended from half to a mile wide. On crossing the belts of timber it literally cleared it off. The Presbyterian church here is a total ruin. Many barns blown down and stock hurt, but none killed except a few hogs. Fences and crops are almost entirely swept away in its track, and household goods and bedding strewn for miles. Have not had any report east of here yet.

A correspondent from Burlingame, Kas., says: The cyclone in this county was more serious than telegraphed from Topeka yesterday. I could not send from here on account of the wires being in bad order. The cyclone first formed between Arvonia and Olivet. It then passed northwest, going out of the county in the direction of Pomona, Franklin county. In its course it killed five persons, including John Rosencranz, John Harper, a man named Brown, two colored children, and a person whose name has not been learned.

The denizens of King City, Missouri, were on Sunday afternoon about half past five o'clock, startled with the approach of the cyclone, making its appearance from the west and holding directly for this point, striking terror to the hearts of all. A feeling of trembling and awe as of certain impending death gives expression to the state of this community. The cyclone had its beginning about two miles south of Rosendale, and twenty miles a little south of west of here. It gathered force as it came on, its mad fury assuming serpentine shape, covering a track varying from 200 feet to a fourth of a mile in width, and sweeping everything clear in its path. It was seen fully an hour before it reached here, and within a mile and a half of here it spread north a trifle, striking the northwest boundary of the town and spending its fury three miles north of here. Houses, stock, trees, shrubbery, and even grass bent and were demolished in its path. The whole track was laid in a desert waste by its furious strides, and the whole territory was strewn with fragments of timber, houses, and domestic articles. While the cyclone lasted the air was filled with material objects, and men were picked up bodily, thrown seventy-five feet in the air and landed a quarter of a mile away. A farmer named Maynard living four miles due west of here, in attempting to escape the cyclone took a wrong course, ran into it and was driven against a fence post and pierced through and through by a four-inch piece of timber. Death ensued shortly after. His grown daughter Grace was carried a quarter of a mile from the house and found in a corn field devoid of clothing except stockings. She, too, died. The rest of the family were saved by fleeing to the cellar of a house that had been blown to fragments and scattered for miles about. R. C. Nelson, a farmer living one mile north of here, while sitting on his back porch reading, was killed. His two sons near by escaped severely injured. The rest of the family were at church. Mrs. Roberts and two children, three miles east of Rosendale, were killed, and house totally wrecked. Several fine country residences were blown to fragments, and several hundred head of stock destroyed, and crops and fine orchards damaged. At Flag Springs several houses were

blown down with considerabie property damaged, and the whole of Empire Prairie suffered incalculable loss.

Hardly had this cyclone passed when slowly rising from the south about four miles distant could be discovered another fully as large as the first, that only spent its fury after a full hour's duration. It took everything in its wake, carrying destruction as it sped on. Outhouses and barns, stock, and every object in its way fell prostrate at its mercy. It took an almost due east direction, resembling in its course much like that of the former, and must have taken in as much territory as did the first one. The house of John W. Catt, four miles south of the town, the first object of its fury, was blown to pieces and the property left a total wreck. Nine persons were in the house at the time. Mr. Catt was severely injured about the head, but will recover. His daughter Bertha, aged three years, had her head crushed, and died at two o'clock this morning. The others were all more or less injured, but none fatally. Frank Berke and others, twenty in all, were sheltered in a farmer's house south of Winslow, and every one was in jured, some probably fatally. The house and barn was a total wreck, with frightful loss of stock. The houses of Phil. Ausmus, Ewing Thomas, Mr. Wolf, John Botts, and Dan Coyle, near by, were destroyed, and it is reported that several more houses have shared the same fate. A report has reached here that a a family of nine, near Berlin, ten miles east of here, were all killed, and another farmer living near Berlin was also killed. A woman with a babe at the breast and another child, names not known, living near Berlin were killed. A young man near Berlin saw the approaching cyclone, attempted to escape, was pitched headlong into a mud hole and suffocated to death. Many more are thought to be killed. As particulars are not all in yet, it may prove even worse.

A terrible cyclone visited the north part of Nodaway county, a few miles south of Hopkins, last Sunday at at about five p. m., causing a great destruction of property and killing James Young. Young's wife was badly hurt, and received injuries that will probably prove fatal. John Crabill and members of his family were also badly hurt, several of whom will probably die. Before the cyclone spent its force it upset the flouring mill of C. S. McMacken and threw it into the river.

Sunday was a terrible day for cyclones in Northwestern Missouri. The atmospheric pressure was very great between four and five o'clock in the afternoon, and during that one short hour no less than three twisters dealt death and destruction in as many paths. The first that came to the knowledge of the St. Joseph *Herald* was from King City and vicinity. This cyclone started, as we have since learned, near Savannah, in Andrew county. The course was northeast through Flat Springs and King City. Many houses were destroyed, and not less than twelve lives lost in Andrew county. At Flat Springs and King City the destruction was much greater. The loss of life in that vicinity was probably fifty men, women and children. The public school building at King City, a large brick, was razed to its foundation. Hundreds of horses, cattle, hogs, and sheep were killed, one man losing eighty cattle, another sixty sheep,

another seven horses. Another cyclone started at Winslow, DeKalb county, another started four miles southwest of Rosendale, passed eastward one mile south of Rosendale. The course of all the above cyclones was east by northeast, Another cyclone started eight miles northwest of Hopkins, in Nodaway county, its course for twelve miles being southeast. It was one-fourth of a mile wide, and nothing escaped destruction in its track. Many lives have been lost in all these cyclones, and the destruction to property is very great.

The outer edge of a fierce wind and rain storm passed Davenport, Iowa, this evening from eight to nine o'clock. The lightning was very vivid and almost continuous. Dispatches state that the storm has been working eastward since the noon before. The town of Colfax was struck by a disastrous tornado, destroying several houses and severely injuring a number of persons. A dispatch says: Reports from the south part of that township show a number to have been badly injured. The rain fell in torrents. Messages received by the train dispatcher of the Rock Island Railroad line state that a heavy thunder and hailstorm passed over Western Iowa this afternoon. The hail was so heavy that several houses were unroofed at Walnut, and the lights broken out of railroad trains and locomotive windows. At four o'clock the storm was traeeling eastward from Des Moines rapidly. The rain literally came down In sheets for half an hour. At four o'clock this afternoon the storm had reached Brooklyn, and was growing milder.

KANSAS WEATHER SERVICE.

FROM OBSERVATIONS TAKEN AT WASHBURNE COLLEGE, TOPEKA,
PROF. J. T. LOVEWELL, DIRECTOR.

The auspicious weather of the first twenty days of May continued through that month and the first week of June. Since then the weather has been rather too warm for comfort, but frequent showers have continued the favorable prospects of crops of grain and fruit.

A destructive cyclone occurred in Ottawa county, near Solomon City, on the 9th, in which three persons lost their lives. and again on the 12th, a still more destructive tornado visited Sumner and Sedgwick counties, while on the same date a similar tempest was developed in Osage county. In each of these localities lives were lost, and many were wounded, but as yet no careful study has been made of these storms in their connection with each other and with the almost simultaneous cyclones reported from Missouri.

Farmers in the Kaw valley were beginning to cut their wheat on the 13th.

Highest temperature, 91° on the 16th. Lowest temperature, 61.5° on the 24th. Highest barometer, 29.08 on the 25th. Lowest barometer, 28.61 on the

29th. Miles traveled by wind, 10,184. Highest velocity of wind, 41 on the 20th. The usual summary by decades is given below:

TEMPERATURE OF THE AIR.	May 20th to 31st.	June 1st to 10th.	June 10th to 20th.	Mean.
MIN. AND MAX. AVERAGES.				
Min	60.3	62.7	67.0	63.3
Max	79.3	86.8	89.6	85.2
Min. and Max	69.8	74.7	78.3	74.3
Range	19.0	24.1	22.6	21.9
TRI-DAILY OBSERVATIONS.				
7 a. m.	66.0	69.4	74.3	69.9
2 p. m.	76.0	83.2	87.3	82.2
9 p. m.	67.4	70.6	76.7	71.6
Mean	69.2	73.2	79.9	74.1
RELATIVE HUMIDITY.				
7. a. m.	.81	.85	.80	.82
2 p. m.	.74	.65	.64	.67
9 p. m.	.87	.85	.81	.84
Mean	.84	.78	.75	.79
PRESSURE AS OBSERVED.				
7 a. m.	28.92	28.85	28.89	28.89
2 p. m.	28.90	28.84	28.86	28.87
9 p. m.	28.88	28.85	28.87	28.87
Mean	28.90	28.85	28.87	28.87
MILES PER HOUR OF WIND.				
7 a. m.	9.0	10.5	13.2	10.9
2 p. m.	14.1	19.3	21.3	18.2
9 p. m.	10.0	12.1	12.2	11.4
Total miles	2,530	3,987	3,367	10,184
CLOUDING BY TENTHS.				
7 a. m.	7.0	3.5	4.5	5.0
2 p. m.	9.1	3.0	2.3	4.8
9 p. m.	2.2	3.5	2.1	2.6
RAIN.				
Inches	.85	2.12	1.12	4.09

THE PRESSURE OF WIND.

In a paper before the American Society of Civil Engineers, Mr. C. Shaler Smith gives the results of many years' observations of wind pressure and its effects. He has personally visited the tracks of destructive storms as soon as possible after their occurrence, for the purpose of determining the maximum force and the width of the path of the storm in every instance. The most violent storm in Mr. Smith's records was at East St. Louis, in 1871, when the wind overturned a locomotive, the maximum force developed in so doing being no less than 93 lb. per square foot. At St. Charles, in 1877, a jail was destroyed, the wind force required being 84.3 lb. per square foot. At Marshfield (Mo.), in 1880, a brick mansion was leveled, the force required being 58 lb. per square foot. Below these extraordinary pressures there were sundry cases of trains blown off rails, and bridges, etc., blown down by gales of wind of from 24 lb. to 31 lb. per square foot. Mr. Smith observes that in all his examples he has taken the minimum

orce required to do the observed damage, and has considered this as the maximum force of the wind, although, of course, it may have been much higher. Some of the hurricanes were very destructive, the one at Marshfield having cut down every thing along a path 46 miles long and 1,800 feet wide, killing 250 people. Mr. Smith has formed the conclusion that notwithstanding these examples, 30 lb. square foot is sufficient wind pressure to allow for in a working specification. As reasons for this conclusion, Mr. Smith expresses doubts as to whether a direct wind or gale ever exceeds this pressure. Whirlwinds may exceed it, but the width of the pathway of maximum effort in these is usually very narrow. Mr. Smith has only found one example, already quoted, wherein the path of pressures over 30 lb. per square foot exceeded 60 feet wide. This pressure is in itself very unusual, and, referring more particularly to railway bridges, it is stated that a loaded passenger train will leave the rails at this pressure of wind, and consequently not much could be gained by making the bridge strong enough to resist a storm which would blow a train off it.—*Scientific American.*

ENTOMOLOGY.

FRIENDLY INSECTS.

PROF. F. H. SNOW, KANSAS STATE UNIVERSITY.

[*Abstract of Lecture delivered before the Douglas County Horticultural Society.*]

He said in substance, that it was generally believed that insects were a nuisance and a curse in the world, but the study of botany and entomology proves quite the contrary. The Professor made the broad statement that if all insect life could be obliterated from the world, vegetation would deteriorate, and finally die out, leaving the animal kingdom to perish for lack of sustenance, and then proceeded by help of his botanical drawings and the extensive cabinet of insects to prove the proposition.

Almost every tree has its species of insects which feed upon it, and in many cases destroy it. As a rule they feed upon the weaker specimens, thus thinning out the forest, and allowing the remaining trees to grow larger and more perfect. In artificial groves and plantations this necessity does not exist, and then it becomes necessary to employ agencies to prevent this destruction..

Cross-fertilization is one of the most useful and important employments of insect life. The stamens of many plants, which have both fertilizing organs perfect, are not ready to discharge the pollen when the pistils of the same plant are in the proper stage to receive it, hence the fertilizing dust must be conveyed from

agency no seed could be produced and the species would in time disappear. This cross-fertilization seems to be an arrangement of nature to prevent "breeding in and in," as it is called, which process or practice would deteriorate the vegetable as much as the animal species. This then, is nature's own method of preserving the beauty, vigor, and quality of the vegetable world.

Insects act as scavengers. Flies attack the flesh, and other insects the bones of dead animals, consuming them, where otherwise they might be allowed to decompose, putrefying and poisoning the atmosphere. Insects purify water from noxious matter, thereby saving us from sickness which might otherwise ensue. They also help the housekeeper in removing filth from the house. Cockroaches are found more abundant where food and dirt are left around the house. There is a very small insect which is quite tenacious of the human cuticle when the conditions are favorable. This insect performs a very commendable office in compelling its host to resort to the use of soap and water and the fine-tooth comb. Of course the horticulturists of Douglas county are not personally acquainted with this species.

The sexton beetle buries up in the ground dead snakes, mice, rats, birds, &c. The Prof. gave some instances of very wonderful exploits by these beetles, burying up animals in a few hours, which were forty times their own weight. Although this is really a service to man, they do it for the purpose of laying their eggs in the dead animal, on which the larvæ feed when hatched out. The tumble beetle lays its eggs in a small bunch of manure and then rolls it into a good sized ball, which is deposited in a soft spot in the soil for the home of its young; this so far, serves to fertilize the land. Of the class commercial insects, it is only necessary to refer the products of the cochineal, the silk worm, the Spanish fly, and the honey bee, all of which form an important part in the commerce of the world.

It is difficult to estimate the value of the parasitical insects. They preven the undue increase of the noxious insects and preserve the balance of the different species. The destructive and dreaded Rocky Mountain locust or grasshopper has several kinds of parasites which prey upon and destroy it. Were it not other plants, which can only be done by the agency of insects. Without this for these parasites, its invasions would be more frequent and its ravages much greater. The lady bug family is very serviceable in destroying plant lice, and should therefore be protected as far as possible. The Professor stated that the European cabbage butterfly had lately made its appearance in this country to the destruction of our cabbage patches. It first appeared in Quebec, Canada, having been brought from England in a vessel, and had, like thousands of other immigrants, traveled westward until it had reached Kansas. Its parasite has not yet arrived, but efforts should be made to bring it here as soon as possible or the future prospect for cole-slaw and sour kraut will be slim. At the close of this interesting lecture, of which this is an imperfect summary, the society returned the Professor a sincere vote of thanks.—*Lawrence Journal.*

THE PERIODICAL CICADA, *alias*, "SEVENTEEN-YEAR LOCUST."

PROF. C. V. RILEY.

The present year will be marked by a quite extended appearance of this interesting insect, both a seventeen and a thirteen year brood simultaneously appearing. The readers of the *Naturalist* are doubtless familiar with the habits and natural history of *Cicada septemdecim* Linn., and those of the thirteen-year race (*C. tredecim* Riley) which agree with it in every respect except in the time required for full development. We will, therefore, simply quote here, with brief comments, what was said in 1868, in the writer's First Report on the Insects of Missouri, regarding the two broods that are to appear the present summer, and that will be rendering the woods vocal with their rattling song, in the more southern parts of the country, by the time the present number is out.

BROOD XVII—SEPTEMDECIM—1864, 1881.

In 1881, and at intervals of seventeen years thereafter, they will, in all probability, appear in Marquette and Green Lake counties, in Wisconsin, and may also appear in the western part of North Carolina, and about Wheeling, Virginia; in Northeast Ohio, and a few in Lancaster county, Pa., and Westchester County, New York.

There is abundant evidence that they appeared in the counties named in Wisconsin in 1864, and fair evidence that they appeared that year in Summit county, Northeast Ohio, while straggling specimens were found in the same year by Mr. S. S. Rathvon, in Lancaster county, Pa., and by Mr. James Angus, in Westchester county, New York. Dr. Fitch also records their appearance in 1847, or seventeen years previously, in the western part of North Carolina, and Dr. Smith, in Wheeling, Virginia, in 1830, '47, and '64. The distance between the localities given is very great, and it is doubtful whether all these records belong to one and the same brood.

BROOD XVIII—TREDECIM—1868, 1881.

In the year 1881, and at intervals of thirteen years thereafter, they will, in all probability, appear in Southern Illinois, throughout Missouri, with the exception of the northwestern corner, in Louisiana, Arkansas, Indian Territory, Kentucky, Tennessee, Mississippi, Alabama, Georgia, and North and South Carolinas.

Though, as already stated, I published the first account ever given of the existence of a thirteen-year brood, yet, besides the others mentioned in this chronology, this particular brood has been traced since, as having occurred in the years 1816, '29, '42, '55, and 68; and Mr. L. W. Lyon, at the July (1868) meeting of the Alton (Ills.) Horticultural Society, even mentioned its appearance in 1803.

In Missouri it occurs more or less throughout the whole state, with the exception of the northwest corner that is bounded on the east by Grand river, and

on the south by the Missouri river.* The southeast part of the state, where Dr. Smith has recorded it since 1829, is most thickly occupied. I enumerate those counties in which there is undoubted evidence of their appearance during the present year (1868), viz.: Audrain, Bollinger, Benton, Clarke, Chariton, Callaway, Cooper, Cole, Franklin, Gasconade, Iron, Jefferson, Knox, Lewis, Marion, Macon, Morgan, Moniteau, Pike, Phelps, Pulaski, Polk, Pettis, Schuyler, St. Charles, St. Louis, St. Francois, St. Clair, Warren, and Washington.

'It not improbably overlaps some of the territory occupied by the *septemdecim* Brood XIV [a brood which appeared last in 1879], but I do not think it extends into Kansas.

In Illinois it occurs more or less throughout the whole southern half of the state, but more especially occupies the counties from the south part of Adams county along the Mississippi to the Ohio, up the Ohio and Wabash rivers to Edgar county, and then across the center of the state, leaving some of the central counties in South Illinois uuoccupied. To be more explicit, I enumerate all the counties in which it undoubtedly occurred during the present year (1868): Adams (south part, back of Quincy), Bond, Clinton (northwest corner, adjacent to Madison), Champaign, Coles, Crawford, Cumberland, Clay, Clark, Edwards, Edgar† (especially in the eastern part), Franklin, Gallatin, Hardin, Hamilton, Johnson, Jasper, Jersey, Jefferson, Lawrence, McLean (east end), Macon, Madison, Marion, Massac, Monroe, Pike, Perry, Piatt, Pope, Richland, Randolph, Sangamon, Saline, St. Clair, Union (northeast corner), Washington, Wayne, Wabash, Williamson, and White. There were none the present year, either at Decatur, in Macon county, or at Pana, in Christian county; nor were there any at Bloomington or Normal, in McLean; nor in Dewitt county, which lies south of McLean; nor in Spring Creek, Iroquois county, which is northeast of Champaign.

In Kentucky, according to Dr. Smith, it occurred in the northwest corner of the State, about Paducah and adjacent counties south, in 1829, '42, and '55, and it occurred there in 1868.

In Arkansas, it occupied all the northern counties in 1842, '55, and '68.

In Alabama, it occupied Russell and adjacent counties on the east side of Black Warrior river, in 1842, '55, and '68.

In Tennessee, it occupied Davidson, Montgomery, Bedford, Williamson, Rutherford and adjacent counties, in 1842, '55, and '68.

In North Carolina, it appeared in Mechlenberg county, in 1829, '42, '55, and '68.

In South Carolina, the Chester district and all the adjoining country to the Georgia line west, and to the North Carolina line north, was occupied with it in 1816, '29, '42, '55, and '68.

In Georgia, it has occurred in Cherokee county since the year 1816.

*As Mr. Wm. Raucher, of Oregon, Holt county, saw a few individuals in the northeast part of Buchanan county, in 1855, it may occur in small numbers in districts evea north of the Missouri river.

†Edgar county also has the *septemdecim* Brood III.

In Louisiana, it appeared in Morehouse, Caddo, Clairborne, Washington, and adjacent parishes, in 1855 and '68.

It also doubtless occurs in Mississippi and Indian Territory, though I am unable to specify any localities.

The last simultaneous appearance of these two broods was in 1660, and their appearance the present year will doubtless enable us to perfect our knowledge of the geographical range of either. Already we have received undoubted indications of their early ascension, as the pupæ have been reported either near or upon the surface of the ground in several of the localities indicated.

It will be observed that the thirteen-year brood (XVIII), is by far the most extended, and that it occurs very generally throughout the Southern States, both east and west of the Mississippi. We have gathered together since the last appearance of this brood in 1868, various facts which extend its range in Georgia and Tennessee, and which show that it also occurs in restricted parts of Indiana. *American Naturalist.*

ENGINEERING AND MINING.

THE TEHUANTEPEC SHIP RAILROAD VS. PANAMA CANAL.

W. L. SEDDON, TOPOGRAPHICAL ENGINEER, COLUMBIA, MO.

When inter-oceanic transit was first proposed, science was still in swaddling clothes; and as to the child many things seem possible, nay, even easy, which to the maturer mind of the man present almost insurmountable obstacles, so in the advance of science the scheme of piercing our rock-ribbed isthmus by a canal has proved a herculean task. But although it be such, in the present development of scientific resource it is folly to say that it is impossible to clear away these barriers and let the mighty oceans clasp hands across the breach. We make no such assertion, but we do contend that science in its onward march has done more than simply show the magnitude of the task and furnish means for its accomplishment; that it has brought forward another and better solution of the difficulty, and it is this latter solution, more especially, which we will now briefly consider.

This proposed plan is not to pierce but to surmount these barriers, to lift the laden ships from the waves by means of our great modern motor, to bear them over these ridges and again consign them to the blue waters on the further side. In short, it is the proposed plan of a Ship Railway. And before we enter upon the discussion of its merits, it is but just to say that were they less apparent, the

fact that it is the proposition of so distinguished an engineer as Capt. Jas. B. Eads, would, of itself, entitle it to a careful consideration. For, as a noted scientific journal has said: "He is not a novice in engineering and finance, nor a speculative adventurer, but a scientific and notably practical man, whose large and varied experience in the planning and conducting of great enterprises gives pertinence and weight to any proposition which he may lay before the world."

In considering the subject, the first question which presents itself is: Is a Ship Railway feasible? The views of distinguished engineers on the point, and a glance at the objections to the road will best enable us to decide this.

Many of the ablest engineers (whose names could be mentioned if any doubt on the subject made it necessary) tell us that the proposed plan is undoubtedly practicable and give it their warmest approval.

Secondly, there are practically but two objections that are urged against it. The first, that a ship will be injuriously strained by her passage on the car; the second, that the weight of its own cargo will produce an undue strain when the ship is lifted from the water.

In the first of these objections we find many causes assigned as likely to produce the injury. To understand their force it will be necessary to describe, as briefly as possible, the road and car upon which the ship will be borne; and in this description we will endeavor to answer the more reasonable of such objections in detail. For the facts in the case I am largely indebted to the able article of Capt. Eads in the North American *Review*, and to the March number of the Illustrated Scientific *News*.

The road will consist of a series of perfectly straight reaches, all changes in direction being made by means of turn-tables constructed for the purpose; this prevents the possibility of lateral straining which might be produced in going around curves.

The track will be composed of twelve rails spaced uniformly five feet apart, by which means the pressure produced by the weight of the ship is transmitted over sufficient surface to prevent any yielding of the road-bed. That this is sufficient may be conclusively proved by comparison with the actual pressure to which some of our railroads constantly subject their road-beds. It is no uncommon thing to have freight trains of one thousand tons weight pass and repass without producing the slightest injury; were six such trains placed side by side on parallel tracks they would fully represent the weight of the largest and most heavily laden ship, and yet the space so occupied covers exactly that over which the car transmits the pressure from the ship, thus happily removing apprehensions aroused by another of these objections, viz.: Danger of strains from the depression of the road-bed.

The car, upon which the ship is to be borne, rests, in the case of the largest ships, upon twelve to fifteen hundred wheels, each two feet in diameter and placed at distances of three feet apart, thus making five tons the greatest pressure any one of them will be required to bear, which is exceedingly moderate, when we consider that the wheels will be made capable of sustaining at least four times

this weight without injury; by which means all probability of the breakage of one or more wheels affecting the stability of the car, or of strains from such a cause, is avoided,

The wheels are separate, each having a disconnected axle, which in connection with the straightness of the track above mentioned and the moderate speed at which the car will move, renders derailment practically impossible and therefore removes this difficulty. All irregularities of the track will be corrected by strong steel springs placed above each wheel.

The body of the car will be composed of plate iron girders, placed laterally, of sufficient strength to sustain the whole weight upon them if they were supported only at their extremities, thus insuring an equal pressure upon all parts. These girders, placed above each set of wheels, will be connected longitudinally by some light though strong frame-work. The great power of the ship to resist a flexure longitudinally, furnishes all the needed rigidity in this direction and makes any extensive connection not only superfluous, but, since such connection would greatly increase the weight of the car, actually injurious.

Equal transmission of pressure is further accomplished by making the car shorter than the ship, thus compensating the heavier parts amid-ship.

Upon this car the ship will be supported very much as she would be in a dry dock; the principal weight rests upon the keel block and the remainder on bilge blocks, but unlike the dry dock, each of these supports is in turn supported upon a hydraulic jack, all of which, by means of pipes are connected with one hydraulic pressure. By this simple but ingenious contrivance the ship rests as completely on the water as if she floated calmly on the bosom of the ocean.

Borne on such a car, straining would seem impossible, while with a maximum grade of only one in a hundred the curvature of which from a level plane can can be made so small that a conformity to it would not bend a ship of the largest size, i. e., some four hundred and fifty feet in length, more than one inch from a straight line, a flexure so slight that it may be entirely disregarded.

As these are the most practical difficulties suggested we may fairly conclude that there will be no danger of injurious straining to a ship in its passage on the Ship Railway.

The second objection, viz.: that the weight of its own cargo will produce an undue strain when the ship is lifted from the water, is even more easily disposed of, for in this case we have the logic of facts in our favor; ships having been frequently lifted from the water and placed in dry docks while loaded, without receiving a strain in the slightest degree injurious. In addition to this no ship is judged seaworthy—fit to meet the shocks and strains of even the lighter storms of the ocean unless it is able to sustain a pressure equivalent to that produced by filling her with water, while in dry docks, to her main deck, a much greater pressure than any cargo could ever produce. May we not then conclude the question of *feasibility* as established beyond controversy.

This point granted, we go further; we contend that besides being as feasible

a means of transit as a canal, it possesses the following advantages: 1st a Ship Railway may be constructed in many localities where a canal would be impracticable, thus giving the Engineer a wider field from which to select a location most advantageous from all standpoints. 2d. that it can be constructed for about one-third, and maintained at about the same cost as a canal. thus enabling it to charge lower rates, and still pay good dividends on moneys invested; a decided advantage to all parties concerned. And 3d, that when a growing commerce shall demand increased facilities of transit, as it most certainly will, this means can be enlarged without interfering with what is already in operation.

These advantages, so weighty and apparent, certainly justify our claim that a Ship Railway is the best means of inter-oceanic transit yet proposed And we may logically consider this conclusion proved for the Tehuantepec Road while there are other advantages applicable to this particular case which we wish to present:

First among these the saving of time. In the rapid growth of our commerce since China and Japan have opened their ports to foreign trade, since the Islands of the Pacific have bloomed into rich gardens from which our merchants may gather golden harvests, and last but not least, since the vast resources of our western coasts have been opened up to the world's trade, there has been an ever increasing demand that this transit be established, and to-day, so urgent is it, that it forms one of the strongest arguments in favor of a Ship Railway, which can be finished in four, as opposed to a canal requiring twenty, years for its completion.

Who can doubt that the Tehuantepec Road, which crosses the Isthmus twelve hundred miles north of Panama, and saves at least fifteen hundred miles to ships from all the great commercial marts of the world—that the Tehuantepec route, which avoids the continual calms of the Caribbean Sea and the Pacific, west of the lower isthmus, making them such dreaded barriers to the sailing vessels —that the Tehuantepec route, which instead bears the ship quickly and safely from the constant winds of the Gulf to the regular trade winds of the Pacific, does not present advantages in point of time which no proposed canal can possibly offer?

The second great advantage claimed for this road is the financial one. Add to the well known business axiom that "Time saved is money gained," the startling difference claimed in the actual cost—that the Ship Railway, crossing a space of a hundred and twelve miles, can be built and put in running order for the comparatively moderate sum of seventy-five millions, while the Panama Canal, cut through the narrowest portior. of the Isthmus, will at the lowest estimate, cost no less than a hundred and sixty-eight millions, to which if we add the interest on such an amount at five per cent. (the rate which M. DeLesseps proposes to pay stockholders from time of subscription), for ten years, the shortest time in which its most sanguine supporters hope to see it accomplished, we would have as the great aggregate two hundred and fifty-two million dollars.

Even if other things were equal would not the *financial* difference be a conclusive argument in its favor?

From a National stand-point also the preponderance of advantage accruing to us as a people, seems scarcely less than the one just considered. That it accords with our policy, as set forth in the Monroe doctrine, to endorse this route, the proposition of one of our citizens and untrammeled by foreign powers, is only one of its many claims to a favorable consideration by Government. It also offers to allow discrimination in favor of American merchandize, with many other liberal concessions. The ease with which it can be defended in case of war is also a not inconsiderable argument in its favor.

Again, too—the Tehuantepec route is within Mexican territory, which, as the distinguished proposer of this route well says, "Is a powerful and friendly Republic, whose history has not only pointed out her aversion to European domination, but has shown her ability to deal successfully with an invasion of her territory." Within the boundaries of this Republic we may safely assert that it will be more capable of protection than in the borders of those lesser states, whose changing faith and government is so proverbial.

So that offered control, ease of defense and in territory both friendly and powerful, form a climax of argument which should neither be ignored nor lightly considered.

To sum up, in conclusion, we have seen that a Ship Railway is *feasible*, that it is better than a canal, the only other suggested method, that the Tehuantepec route meets these *general* points, and offers *special* advantages no less decided, viewed from the time-saving, financial and national stand points. With these proved, are we not justified in pronouncing that the Tehuantepec Ship Railway is the best means of inter-oceanic transit.

OLD SPANISH MINES IN NEW MEXICO.

A. R. GREENE.

One of the most interesting spots in New Mexico is the old mining camp in the Cerrillos Mountains, located twenty-five miles southwest of Santa Fe. These mountains comprise a group of five peaks that rise to an elevation of from 500 to 1,000 feet above the plain, with their surrounding foot hills, in all covering an area of thirty square miles. These mountains contain upward of fifty Spanish mines, abandoned two centuries ago, and many of them scarcely recognizable owing to the efforts of the Pueblo Indians to obliterate all traces of them at the time of the insurrection in 1680. The most interesting of these are the Nina del Tiro and Turquoia mines, a few miles north of Cerrillos station, on the Atchison, Topeka and Santa Fe railroad. The first is a silver mine, and yielded $3,000,000, according to the records of the Catholic Church, which received tithes of all mines operated at that time. The shaft is an irregular incline, and can be descended by ladders to a depth of 120 feet, where further progress is interrupted by water. Its entire depth is unknown, but judging from the amount of debris at the mouth of the mine it must have been at least 200 feet. Attempts to sound

it with a line have failed, as the circuitous windings of the mine continue below the water. At the water level the mineral in sight is a fine grained galena carrying gray copper, the vein being four feet in width. This mine is in litigation at present, and is locked and guarded. The sentry subjected our party to a rigorous cross-examination, but finally consented to open the trap door and allow us to descend the ladders into the mysterious depths, from whence we secured several beautiful specimens of quartz crystals.

Chalchuitl, the Indian name for turquoise, is a bluish green stone found in thin veins and pockets, like nuggets, encrusted with a whitish lime formation. The Indians regard it as a sacred stone, and prize it accordingly. They valued it above silver or gold, and endured untold hardships to obtain it. History does not state when they began to mine for it, but judging from the enormous amount of work that has been done, the crude methods employed, and other circumstances, it must have been prior to the discovery of the continent by Europeans.

The turquoise mines, on Turquoise mountain, are three miles north of Cerrillos, and should be examined by every visitor to the Territory. The mountain is literally honey combed with shafts and tunnels and smoke-begrimed caves. There are two immense open cuts, the largest of which is 300 feet in width and at the present time about 100 feet in depth, although in re-opening the principal shaft it was discovered that the depth was fully 200 feet at the time work was abandoned. This immense excavation is in solid rock, the sides sloping irregularly to the center like the crater of a volceno.

About the first of the year 1880, or two hundred years after the Spaniards abandoned them, a New York company undertook to re-open the mines. A shaft was commenced in the debris in the bottom of the excavation I have described, and sunk to a depth of 100 feet, striking almost exactly upon the mouth of the original shaft, which they found in a state of good preservation, with the pole ladders still intact. These ladders are from twelve to fourteen feet in length and about eight inches in diameter, and are notched on opposite sides at intervals of twelve inches for steps. They reach from one landing to another, and furnish the only means of entrance and exit. The ore and debris, as well as the water of the mines, was carried up these ladders in leathern pouches on the backs of the Pueblo Indians, whom the Spaniards upon acquiring the country reduced to the most abject slavery.

Stone tools were used exclusively in mining, excepting a peculiar kind of copper wedges. The theory is that the ledge was heated by building fires against it, and that then the water was thrown upon it, and that the seams thus opened were forced apart by the wedges and the rocks broken up into convenient sizes for handling. These rude tools are found scattered among the debris, and no evidence of any others exist.

Large quantities of gold and silver were obtained in the same manner in other mines. The ore was smelted in rude furnaces constructed of stone and cemented with mud.

From some cause, not easily explained, threre were no supports to the tun-

nels, no timbering, no precautions against caving of the mines; entire dependence having evidently been placed in the solidity of the rock. The tunnels are many of them several feet in width, and high enough to admit of entering without stooping, but others are much smaller and very circuitous, and resemble the burrowings of animals in the earth. As to the depth of the mines, or the extent of the tunnels, nothing is now known, and any estimate would be but the wildest conjecture. The debris covers an area of fully twenty acres around the "crater" to a depth of from five to fifteen feet. How long it required the peons to bring this vast accumulation of rock to the surface can scarcely be imagined, even though a large force of them was employed. With modern appliances for hoisting, it would require many years; with the crude means I have described, a century. On the top are growing cedar trees two feet in diameter, which establish the antiquity of the mines.

History states that in 1680 a land slide occurred, which buried twenty-five Indian miners. The Spaniards ordered the neighboring pueblo of San Marcos to supply laborers to take their places, which demand was refused. The Spaniards resorted to force, and the result was the great insurrection which drove them from the country. When they returned, thirteen years afterwards, no efforts were made to re-open the mines which the Indians had filled up and sought to obliterate. There is a tradition that this was a part of the stipulation when the Indians surrendered. It is certain that since the second conquest the Spaniards and Mexicans have directed their attention almost exclusively to pastoral and agricultural pursuits.

It is recorded that two unusually large and valuable specimens of turquoise were taken from Turquoise mountain, sent to the Emperor of Spain, and placed in the royal crown. Our party secured a few inferior specimens, together with some fragments of the ancient ladders and several beautiful "pin cushion" cacti as mementoes of the trip.

The view from the top of the mountain is remarkably fine. In the immediate vicinity are the Bonanza and Monitor silver mines, now being actively worked; a little farther away Carbonateville, a promising mining camp; beyond these an open plain covered with scrubby cedar and piñon, and beyond this, to the north, the city of Santa Fe, with the white summit of Old Baldy shining above it against the blue sky. To the east and south the Cerrillos range, and to the west, low down a distant valley, a narrow band of emerald that outlines the Rio Grande.

A few miles southeast of Cerrillos station are the ruins of the Aztec pueblo o Molla, a walled town that was flourishing at the time of the Spanish conquest. Unlike other ancient pueblos, this was walled with stone, the remains of which are plainly to be seen at the present time. It must have been a mining town, as old furnaces, piles of slag and cinders are seen on every hand. In the neighboring mountains are numerous shafts and excavations, from whence the ores were derived. There is a tradition that when the Spaniards were driven from New Spain in 1680 they buried $10,000,000 near Molla; but the cache has never been discovered.

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A short distance south of the station are the old placers worked by the Indians and Spanish hundreds of years ago. Remains of their ditches may still be seen, and there is abundant evidence that the mines were at one time very rich. Recent discoveries have established the existence of gold in paying quantities throughout the entire range, a scarcity of water being the only drawback to its development. A project is being set on foot to introduce several large steam pumps to bring water from the Galisteo for the purpose of mining by hydraulics.

Cerrillos has the best, if not the only, vein of anthracite coal west of Pennsylvania. It is four feet in thickness, and accessible to the railroad. Mines of bituminous coal of a superior quality also abound, the product of which is being shipped as far west as Los Angeles, California.—*Kansas City Journal.*

BOOK NOTICES.

LITERARY STYLE, AND OTHER ESSAYS, by William Mathews, LL. D; 12mo., cloth, pp. 345; Chicago; S. C. Griggs & Co.; 1881; $1.50.

Dr. Mathews is one of the most prolific writers as well as one of the most popular essayists of the day. His style is attractive, his works are replete with information of a valuable character, and his ideas are illustrated with anecdotes and quotations from the best sources. Everything he writes is of an elevating and instructive character, and a set of his works would fill an important place in any library, especially one frequentedby younger readers. The volume under consideration is no exception in point of excellence. Its contents are as follows: Literary Style, The Duty of Praise, Periodical Literature, The Blues and their Remedy, The Modesty of Genius, Sensitiveness to Criticism, The Ideal and the Real, Fat vs. Lean, Memory and its Marvels, Fools, Angling, Intellectual Playfulness, A Plea for the Erring, The Secret of Longevity, The Season of Travel, Hot-House Education, Originality, The Art of Listening, Who Are Gentlemen? Office Seeking, Americanisms. S. C. Griggs & Co.'s reputation is such that it is almost needless to say of this book that it is a model of good typography in every respect.

THE SCHOOL OF LIFE, by William Rounseville Alger; Boston; Roberts Brothers; 1881; $1.50; for sale by Kansas City Book and News Company.

This small volume of 200 pages contains many gems of thought, expressed in most elegant and beautiful language. The general outline of the work is that the world is the school; God, the founder and head; desire, thought, labor, experience, and example the general teachers; education the business of life; nature the original text book; the lessons learned docility, energy, submission,

faith, love, exemplification; the true aims of the pupils the possession of the body, the possession of the soul, the possession of society, the possession of the universe; closing with the motives in the school, etc. It is exalted in tone and full of elevating, practical suggestions, adapted to both young and old, not only in a moral and religious sense, but also in the literary and physical education and training of children and youth.

How to tell the Parts of Speech, by Rev. Edwin A. Abbott, LL. D.; Boston; Roberts Brothers; 12mo, pp. 143; for sale by Kansas City Book and News Company; seventy-five cents.

Dr. Abbott has long been head master of the city of London school, and is the author of quite a number of works of a similar character, suggested by his daily observation and in the performance of his duties. This American edition is revised and enlarged by Prof. McElroy, of the University of Pennsylvania. The work is really an English grammar, but being designed to simplify the manner of teaching usually adopted in such books, the author prefers this title, and, indeed, he has produced a far more attractive and comprehensive work than is ordinarily found in the schools, at least those of the United States. It is difficult to describe his manner of teaching grammar, even while approving it, without giving copious quotations which we have no space for, but it may suffice to say that it is natural and logical, that his illustrative passages are well chosen and of a character calculated to interest the pupil, and that no one can study this book without being able afterwards to "tell the parts of speech." An appendix on spelling has been added to the second edition, also a summary of definitions, together with an etymological glossary of grammatical terms. The work of the American editor has been confined to adding a few technical terms, paragraph numbers and exercises, with the consent of Dr. Abbott. Teachers will find this little work a very useful adjunct to their text books.

Nests and Eggs of American Birds, by Ernest Ingersoll; parts I, II, III, 8vo, pp. 24, illustrated; Salem, Mass.; Geo. A. Bates; fifty cents per number.

In accordance with the announcement made by us in the June issue of the Review, Prof. Ernest Ingersoll has put forth the initiatory numbers of his beautiful and comprehensive work. They are fully up to the standard promised in matter, illustrations, and typography, and no lover of birds need fear that the most ample justice will not be done them, both by the skilled author and his publisher.

Scientific Sophisms, by Samuel Wainwright, D. D.; 4to, pp. 27; New York; J. Fitzgerald & Co.; fifteen cents.

This is No. 23, Vol. 1, of the Humboldt Library, and is a review of current

theories concerning atoms, apes, and men. It can only be appreciated after a careful perusal, when it will be acknowledged that there are two sides to the questions discussed, and that Dr. Wainwright is a powerful and skillful debater as well as a thoroughly competent man to meet and hold his own with the popu lar theorists of the day. The first volume of the Humboldt Library will close with the next number, when for $3.00 one can procure the best works of Proctor, Tyndall, Huxley, Spencer, Marcel, Flammarion, Bain, and other prominent modern writers.

OTHER PUBLICATIONS RECEIVED.

Political Economy and Political Science, compiled by W. G. Sumner, David A. Wells and others; 12 mo., paper, 25 cents.—Inter-State Railroads and Their Regulation by Congress, by Robt. P. Harlow; 8vo., pp. 36.—Sewerage: Its Application to Kansas City, Mo., by Robt. Gillham, C. E.; 8vo., pp. 22.—A Primer of Memory Gems, by Geo. W. Hoss. Topeka, Kans.; 16mo., pp. 32, 10 cents.—Inaugural Address of Hon. W. G. Ritch, President of the Historical Society of New Mexico, with the Charter, Constitution and By-Laws of the Society.—Objects of Sex and of Odor in Flowers, by Prof. Thos. Meehan, Professor of Botany, State Board of Agriculture of Pennsylvania.—Notes on Treeless Prairies, by Same.—Antiquities of the Missouri Bluffs, by S. V. Proudfit.—Proceedings of the XIV Annual Session of the Missouri Press Association, held at Sedalia, Mo., May, 1880.—Address to the Missouri Press Association, convened at Jefferson City, Mo., May 10, 1881, by James B. Price.—Atti Della Societa Toscana di Scienze Naturali, Marzo 13, 1881.—On the Reduction of Air Pressure to Sea Level and the Determination of Elevations by the Barometer, by H. A. Hazen, A. M.—Hints on Orthography, by C. T. Pooler, A. M.; published by C. W. Bardeen, Syracuse, N. Y..—The Mississippi River, and What its Proper Utilization will Accomplish, by J. M. Osborn, Toledo, O.

An interesting fact in connection with our old friends, the Rocky Mountain locusts, was brought to light here during the week. While cleaning away an accumulation of "spalls," mortar and clay in the rear of the Laboratory, the workmen discovered, in the unbroken ground beneath, a considerable number of nests of grasshoppers' eggs, at the depth of six or eight inches. The rubbish above referred to was placed in position in the fall of 1876, shortly after the deposit of the eggs the same fall. These eggs, appearing fresh and healthy when taken from the ground, were placed, by Supt. Graham, under favorable conditions for hatching; and, in due time, a swarm of lively juvenile *Caloptenus spretuses* came from these four and-a-half-year-old eggs.—*Industrialist.*

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SCIENTIFIC MISCELLANY.

KANSAS CITY INDUSTRIES.

Hereafter we shall devote a small portion of THE REVIEW to an account of the various industries of Kansas City, and begin this month with

THE KANSAS ROLLING MILL COMPANY.

The works consist of a rail mill, which was moved here from Decatur, Illinois, trains of rolls for making merchant bar, universal iron, splices and spike rod; a spike, bolt and nut factory; a forge and a machine shop.

The shipments of this company in 1880 were as follows: Heavy rails, 19,690 tons; mine and steel rails, 269 tons; fish plates, 4,816 tons; spikes, 2,730 tons; merchant iron, 549 tons; harrow teeth, 72 tons; universal iron, 57 tons; miscellaneous, 54 tons. Total, 28,237 tons. To manufacture this required about 3,000 car loads of iron; 2,500 cars of coal, and perhaps 250 cars of fine sand, fire brick, clay, oil, etc. The number of employees varies from 500 to 600. There are 8 furnaces for rail mill, 2 for the 18-inch train, 1 for the 9-inch train, and 6 for spike rod. The universal rolls are driven by the rail mill engine, and have no separate furnaces The iron from them is principally used for girders and lintels in the new buildings in Kansas City.

To drive the various machines and roll trains there are required nine engines of various sizes, besides five steam pumps. The steam is supplied by eight boilers 28 feet long and 40 inches in diameter, placed so as to utilize the waste heat of the furnaces, and six boilers of the same size in three batteries. Two more boilers for a fourth battery are now being erected.

The principal business of this company is with railroad companies, and they are gradually increasing their facilities with the view of supplying all the iron work required in building a railroad.

THE KANSAS IRON FENCE COMPANY.

Connected with the Kansas City Rolling Mill Company is the Kansas Iron Fence Company, who manufacture all kinds of wrought iron work, garden fences, cresting, girders, anchors, gratings, etc.; some iron bedsteads and several kinds of agricultural implements. This company employs 60 men, and is growing rapidly.

The officers of the Rolling Mill Company are A. B. Stone, President; Ira Harris, Vice-President and General Manager; E. V. Wilkes, Secretary, and D. S. Mathias, Superintendent. Of the Fence Companies the officers are: Ira Harris, President; E. V. Wilkes, Treasurer, and J. R. Brown, Secretary.

For a year past the Kansas Rolling Mill Company has been engaged in experimenting with coal dust as fuel, instead of lump coal, with some remarkable

results. They have a separate building with its own engine and a large amount of valuable machinery. The complete success of this work would be of the greatest benefit to Kansas City, where fuel is one of the most important considerations in developing manufactures.

A special article on the theory and experiments with coal dust fuel will probably be furnished this Magazine before long.

THE CENTER OF POPULATION.

St. Louis is located almost exactly at the ultimate center of population of the republic, and the progress of that center toward its final destination is a matter of considerable interest to the intelligent people of the future great city. There is probably a popular misapprehension as to what the center of population of the country really is. It is often taken to mean that point which has an equal population on opposite sides, but this conception of it is erroneous. The center of population is that point on opposite sides of which the number of inhabitants multiplied by the sum of their distances from it are equal. It is aptly defined as the center of gravity of population, that is to say, the point from which if the whole population of the country were suspended in place, it would exactly balance. This definition of course assumes that every person, large or small, constitutes a unit of weight. If a line be drawn due east and west through the center of population, and all the people on such a line travel to the center, the sum of the distances traveled by those going east and west respectively will be equal. If all parts of the country were covered by a population of equal density, the center of population would be at the geographical center. The geographical center of the country is in Northern Kansas, slightly nearer the western than the eastern boundary of that state, and not far from the thirty-ninth parallel of latitude. Dividing the country by a meridian through this point, the western half is found to be by far the most infertile, and consequently the least able to support population. Multiplying area by fertility, it is discovered that the meridian which divides the country into two parts of equal power to sustain population, passes very near St. Louis. The two zones into which the thirty-ninth parallel divides the country do not differ greatly in sustaining power, and the center of population will eventually rest near that central parallel, which also passes near St. Louis.

The progress of the center westward has been at the rate of about fifty miles during a decade. In 1790 it was east of Baltimore, being then, as it is now, near the thirty-ninth parallel. In 1840, fifty years afterwards, we find it twenty-two miles south of Clarksville, in West Virginia, in latitude 39.02. From this time it quickened its pace, and in 1850 it had reached a point twenty-five miles southeast of Parkersburg, West Virginia, fifty-five miles west of the last position, and in latitude 38.59. In 1860 it was twenty miles south of Chillicothe, Ohio, in latitude 39.03, having made eighty-two miles of westing during the decade.

This increase in its advance was owing to the rapid settlement of the Pacific slope, which not only worked an unusual transfer of population from east to west, but effected an abnormal displacement of the center, by locating the new western population at the longest possible distance from it. If San Francisco be 2,000 miles from the center of population, and St. Louis 400, one person in the former city will count equal to five in the latter in determining its position. Every inhabitant works on the center with a leverage equal to his distance from it, so to speak, hence it is not only the movement of population which affects the center, but also the distance which it moves. In 1870 the center was forty-eight miles east by north of Cincinnati, in latitude 39.15, having made only forty-six miles of westing, and performed the novel feat of veering some fifteen miles northward. But this was the war decade, when the increase of population in the south was almost wholly arrested, and the movement of population westward seriously disturbed. The wonderful increase of the south in population during the past decade has brought the center again back to the central parallel, and it is now supposed to be in Northern Kentucky, five miles west of Covington, in about latitude 39.03. Its position is about ten miles east of the boundary line between Ohio and Indiana, and fifty-one miles west of its location in 1870.

It is well to remark, however, that this latter determination is only approximate. The Census Bureau is said to be ascertaining the population to each square degree of territory for the purpose of locating the center with the greatest practicable accuracy. It is certain, however, that its present position is west of Cincinnati, and that its movement westward during the last decade was fully up to the average of the last ninety years. It has moved westward about 450 miles since 1790, and is now within about 300 miles of St. Louis. An advance at the same average rate would bring it here in sixty years, but as the density of population increases to the westward it ought to move slower in that direction. Still it is not likely that its advance will be materially lessened during the present decade. The tide of population is flowing westward with unprecedented volume, and the capacity for absorption in many favored regions is still immense. A new and heavy movement will follow the completion of the Northern Pacific railroad, and taking everything into consideration it would not be surprising if the advance were greater during the present decade than it was in the last.—*Globe-Democrat.*

NOTES AND QUERIES.

THE MISSISSIPPI AND MISSOURI RIVERS.

I have found in my reading the following names applied to these rivers. If the readers of the REVIEW know of others I should be glad to have them reported:

Indian names for the Mississippi — Meico, Mescha-Sibi-Mescha, Namosi-Sipon, Okimo-Chitto, Mesipi, Misseepe, Meact-Chassipi, and Malbouchia.

French — Riviere deLaConception, Riviere de Colbert, Riviere de St. Louis, and Mississippi.

Spanish — Rio Grande, Rio Grande del Espiritu Santo, Rio de la Eulata, Rio de la Palisada, and Rio de Chuchaqua.

Indian names for the Missouri — Pekitanoui, Missouri.

French — Riviere des Ozages, Riviere de St. Philip.

English — Yellow River. J.

In 1834 there was published in the Osage language, at Boston, Mass., a book entitled, Washashe Wageressa Pahugreh Ise, 1 vol., 18 mo. Is there any reader of the REVIEW who knows of a copy of this book? OSAGE.

The Rev. James French, in his article entitled "Science in Revelation," published in the last number of the REVIEW, is in the fog when he asserts that the real mathematical ratio existing between the diameter and the circumference of *the circle has been found.* I do not know anything about Mr. Parker's investigations in regard to the *quadrature of the circle*, but this I will say: That Mr. Parker never found the exact ratio; and furthermore, the so-called "Parker Formula" is not sufficiently accurate for mathematical computation, as can be easily demonstrated. Respectfully submitted,

J. M. GREENWOOD.

In reply to inquiry in REVIEW, will say: E. P. Walsh, of St. Louis, Mo., is Secretary of the Missouri Historical Society. G. C. B.

MOUND EXPLORATIONS IN NORTHERN MISSOURI.

On June 9, in company with Drs. Kimlin, Berry, and Rutlon, and Messrs. Tindall, Swayze, Murray, W. Witlen, T. Witlen, and laborers, we opened a mound about three miles northeast of Trenton, from which we removed portions of at least twenty-five human skeletons, without finding any relics or implements. Said mound is nearly circular in form, may possibly be a little longer east and west than north and south. We estimate that the mound, only thirty to forty feet in diameter, has contained from 150 to 200 skeletons. There appears to have been a stone floor upon which the bodies have been placed; over them a stone covering, supported probably by stones set edgewise; upon which were placed other bodies; this continuing until there were four layers of corpses and five layers of stone. The bones are now on exhibition at Kimlin's drug store.

* * * * Many of the bones crumbled to pieces on exposure. We have, however, an almost perfect sacrum, many femurs, acetabula, portions of ilium and ischium, humerus, spines of scapula, cranial bones, and bones of feet and hands; also tibias.

Respectfully, E. F. HORTON.

The editor of the Missouri *Republican*, in the issue of June 13, in reply to an inquiry by a correspondent in regard to the abbreviation Mo. for Missouri, states that Missouri means muddy, while J. P. Jones, in the last number of the REVIEW, says it means canoe. Which is correct. OSAGE.

Can any of your readers inform me if there were any medals of honor distributed to any of the sailors or soldiers who served in the war of the Rebellion?

A. C.

Can any student of Kansas history inform me how far north Coronado reached in his celebrated march in search of the seven cities of Cibola?

A. C.

THE MAGNETIC SURVEY OF MISSOURI ASSURED.

Prof. Nipher writes as follows: "You will be interested in knowing that a gentleman of St. Louis, whose name is withheld at his own request, has volunteered to pay the expense of the magnetic survey for the coming summer. This arrangement will of course give me more time to work out the subject in a way which will give more valuable results to science than if I were obliged to give attention to the details of establishing meridian lines for the use of surveyors. So far, the action of the Legislature is of advantage. It is perhaps wortny of record as a fact which may be of interest to the future historian, that the Missouri Legislature of 1881 refused to authorize county courts to employ a competent person to establish a true north and south line at the county seat, the compensation for such work to be such as might be mutually agreed upon, not to exceed fifty dollars. This bill was introduced in the House, and was rejected in that body by a decided vote. Comment on such legislation is unnecessary."

REMARKABLE COMETS.

In unenlightened ages comets were looked on with terror, as portending pestilence, war, the death of kings, or other calamitous or remarkable events. Hence it happens that in the earlier descriptions of these bodies, they are generally associated with some contemporaneous event. The descriptions of the comets themselves are, however, so vague and indefinite as to be entirely devoid of either instruction or interest, as it often happens that not even their course in the heavens is stated.

The Great Comet of 1680 is, as already said, remarkable for being not only a brilliant comet, but the one by which Newton proved that the comets move under the influence of gravitation of the sun. It first appeared in the autumn of 1680, and continued visible most of the time till the following spring. It fell down

almost in a direct line to the sun, passing nearer to that luminary than any comet before known. It passed its perihelion on December 18th, and, sweeping round a large arc, went back in a direction not very different from that from which it came. The observations have been calculated and the orbit investigated by many astronomers, beginning with Newton; but the results show no certain deviation from a parabolic orbit. Hence, if the comet ever returns, it is only at very long intervals. Halley, however, suspected, with some plausibility, that the period might be 575 years, from the fact that great comets had been recorded as appearing at that interval. The first of these appearances was in the month of September, after Julius Cæsar was killed; the second, in the year 531; the third, in February, 1106; while that of 1680 made the fourth. If, as seems not impossible, these were four returns of one and the same comet, a fifth return will be seen by our posterity about the year 2255. Until that time the exact period must remain doubtful, because observations made two centuries ago do not possess the exactitude which will decide so delicate a point.

Halley's Comet.—Two years after the comet last described, one appeared which has since become the most celebrated of modern times. It was first seen on August 19th, 1682, and observed about a month, when it disappeared. Halley computed the position of the orbit, and, comparing it with previous orbits, found that it coincided so exactly with that of comet observed by Kepler in 1607, that there could be no doubt of the identity of the two orbits. So close were they together that, if drawn on the heavens, the naked eye would almost see them join into a single line. The chances against two separate comets moving in the same orbit were so great that Halley could no doubt that the comet of 1682 was the same that appeared in 1607, and that it therefore revolved in a very elliptic orbit, returning about every seventy-five years. His conclusion was confirmed by the fact that a comet was observed in 1531, which moved in apparently the same orbit. Again subtracting the period of seventy-five years, it was found that the comet had appeared in 1456, when it spread such terror throughout Christendom that Pope Claxitus ordered prayers to be offered for protection against the Turks and the comet. This is supposed to be the circumstance which gave rise to the popular myth of the Pope's Bull against the Comet.

This is the earliest occasion on which observations of the course of the comet were made with such accuracy that its orbit could be determined. If we keep subtracting 75½ years, we shall find that we sometimes fall on dates when the apparition of a comet was recorded; but without any knowledge of the orbits of these bodies, it cannot be said with certainty that they are identical. However, in the returns of 1456, 1531, 1607, and 1682, at nearly equal intervals, Halley had good reason for predicting that the comet would return again about 1758.

De Damoiseau announced that it would reach its perihelion on November 4th, 1835; while De Pontécoulant, after revising his computations with more exact determinations of the masses of the planets, assigned November 13th, at

1 A. M., as the date. The expected comet was, of course, looked for with the greatest assiduity, and was first seen on August 5th. Approaching the sun, it passed its perihelion on November 16th, at eleven o'clock in the morning, only three days after the time predicted by De Pontécoulant.

The Lost Biela's Comet.—Nothing could more strikingly illustrate the difference between comets and other heavenly bodies that the fact of the total dissolution of one of the former. In 1826, a comet was discovered by an Austrian named Biela, which was found to be periodic, and to have been observed in 1772, and again in 1805. The time of revolution was found to be six years and eight months. In the next two returns, the earth was not in the right part of its orbit to admit of observing the comet; the latter was therefore not seen again till 1845. In November and December of that year it was observed as usual, without anything remarkable being noticed. But in January following, the astronomers of the Naval Observatory found it to have suffered an accident never before known to happen to a heavenly body, and of which no explanation has has ever been given. The comet had separated into two distinct parts, of quite unequal brightness, so that there were two apparently complete comets, instead of one. During the month following, the lesser of the two continually increased, until it became equal to its companion. Then it grew smaller, and in March vanished entirely, though its companion was still plainly seen for a month longer. The distance apart of the two portions, according to the computations of Professor Hubbard, was about 200,000 miles.

The next return of the comet took place in 1852, and was, of course, looked for with great interest. It was found still divided, aod the two parts were far more widely separated than in 1846, their distance having increased to about a million and a half of miles. Sometimes one part was the brighter, and sometimes the other, so that it was impossible to decide which ought to be regarded as representing the principal comet. The pair passed out of view about the end of September, 1852, and have not been seen since.

The Great Comet of 1843.—This remarkable comet burst suddenly into view in the neighborhood of the sun about the end of February, 1843. It was visible in full daylight, so that some observers actually measured the angular distance between the comet and the sun. It was followed until the middle of April. The most remarkable feature of the orbit of this comet has been already mentioned: it passed nearer the sun than any known body—so near it, in fact, that, with a very slight change in the direction of its original motion, it would actually have struck it. Its orbit did not certainly deviate from a parabola. The most careful investigation of it—that of Professor Hubbard, of Washington—indicated a a period of 530 years; but the velocity which would produce this period is so near the parabolic limit that the difference does not exceed the uncertainty of the observations.

Donati's Comet of 1858.—This great comet, one of the most magnificent of modern times, which hung in the western sky during the autumn of 1858, will be

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well remembered by all who were then old enough to notice it. It was first seen at Florence, on June 2d, 1858, by Donati, who described it as a very faint nebulosity, about 3' in diameter. About the end of the month it was discovered independently by three American observers: H. P. Tuttle, at Cambridge; H. H. Parkhurst, at Perth Amboy, New Jersey; and Miss Maria Mitchel, at Nantucket. During the first three months of its visibility it gave no indications of of its future grandeur. No tail was noticed until the middle of August, and at the end of that month it was only half a degree in length, while the comet itself was barely visible to the naked eye. It continued to approach the sun till the end of September, and during this month developed with great rapidity, attaining its greatest brilliancy about the first half of October. Its tail was then 40° in length, and 10° in breadth at its outer end, and of a curious feather-like form. About October 20th it passed so far south as to be no longer visible in northern latitudes; but it was followed in the southern hemisphere until March following.

EDITORIAL NOTES.

THE Annual Meeting of the Kansas City Academy of Science was held at the First Presbyterian church on the evening of May 31. The anniversary address was delivered by Gen. S. R. Bowman, his subject being "The Mistakes of Great Cities." At the conclusion of the address, which was a brief review of the errors in engineering and sanitation in various prominent cities of the world, with practical suggestions on these subjects for our own municipal authorities, the yearly reports of the various officers were read and adopted.

The Treasurer reported the receipts of the year as $224.25, the disbursements, $97.70, balance on hand, $126.25.

The Assistant Librarian and Custodian of the Museum reported the number of volumes in the library as 119, the number of mineralogical specimens 129, the number of geological specimens, including fossils, 476, the number of archæological specimens, 180.

The election of officers for the ensuing year was then held, resulting in the choice of Hon. R. T. VanHorn, as President; Wm. H. Miller, Vice President; Prof. J. D. Parker, Recording Secretary; Theo. S. Case, Corresponding Secretary; Dr. T. J. Eaton, Treasurer; Dr. R. W. Brown, Assistant Treasurer; H. P. Child, Librarian; S. J. Hare, Custodian of the Museum; Dr. George Halley, Member of Executive Committee. The Academy then adjourned until the third Tuesday in September.

CAPT. HOWGATE writes from San Francisco June 10: "The Rodgers has not sailed yet, but expects to get away next week. The Academy here gave the officers of the ship a fine reception last week, at which Mr. C. W. Brooks read a very interesting paper on The Jeannette Expedition."

ALEXANDER W. BROWNE, the Signal Service Observer, U. S. Army, at Leavenworth, Kansas, paid this office a hurried call a few days since. He is a zealous and careful observer and is doing good work at his post.

Two simultaneous dispatches were received

June 22d, by Prof. Swift, at the Warner observatory, by which it appears that another great comet has been discovered. Prof. Sharpless, of Haverford college, Pennsylvania, states that L. F. Edward saw it with his naked eye, and Edgar L. Larkin, of New Windsor, Ill., also reports seeing it, and that it is a vast new comet. It is located in the constellation Auriga, about eight degrees from Capella, and it is not improbable it may be the much expected comet of 1812, which should appear not far from that locality. There is some question as to whether the honor of discovery and the Warner prize of $200 belong to Larkin or Edwards.

The comet reported to have been discovered in two places in the Eastern states last week was also seen at San Francisco, by Prof. Hanks. It was seen at Bodie, Cal., at 4:43 a. m., where the nucleus was well defined and brilliant. The tail was observed at Tombstone, Ar., at four a. m. with a nucleus apparently half the size of a full moon. The tail is fan-shaped and very brilliant. All dispatches state that the comet was northeast northerly, heading northwest, and just above the horizon.

The unexpected visitor is believed to be the famous comet of 1812, which possessed a head 1,270,000 miles in diameter, with a nucleus in the center 2,640 miles in diameter, and a tail 1,000,000,000 miles long. The comet of 1812 is expected to appear on its return trip not far from the point at which this one is seen, namely, in the constellation Auriga, about eight degrees from Capella.

PROF. SNOW, of the Kansas State University, closes a recent letter as follows: "Please accept my congratulations upon the improved appearance and constantly increasing excellence of the REVIEW."

THE FrenchGovernment having applied the electric light to four of its light-houses and become satisfied with the experiment, has resolved to use it on all its other sea-signaling stations.

M. A. MEYNDORF, Melter of the United States Assay Office, at Helena, Montana, has been directed by Director of the Mint Burchard to assist E. C. Jewett, at St. Louis, Mo. The latter has recently been appointed Assayer in charge of the latter office.

IN conformity with the vote at the last meeting, the thirtieth meeting of the Association for the Advancement of Science will be held at Cincinnati, Ohio, commencing at ten o'clock, a. m., on Wednesday, the 17th of August, 1881. A large and efficient local committee has been formed and, through its several sub-committees, is engaged in perfecting the local arrangements for the meeting, which will be announced by special circular in a few days. The headquarters of the Association will be at the Music Hall, where members will register as soon as possible after arrival. The Grand Hotel, on Fourth street, has been selected as hotel headquarters. The offices of the local committee and of the Permanent Secretary will be at the Music Hall. The general sessions and the meeting of the sections, sub-sections, and committees, will also be held under the same roof. The circular of the local committee will contain full information in relation to hotels and boarding houses, with which special arrangements have been made, and also the special railroad rates agreed upon.

THE orders for bound volumes of the REVIEW have been more numerous than ever before, and we have been especially gratified by receiving three orders for full sets (four volumes) within the past month; one from Washington City, one from Sioux City, and one from Marion Center, Kansas.

The Geological chart published on page 138 of this number of the REVIEW is a reduced copy of one used by Prof. H. A. Reid, of Des Moines, Iowa, "in illustration of the successional order of sentient life on the earth, as taught by modern science, and showing how naturally and harmoniously the Bible doctrine of angels joins on in its proper place after the age of man."

THE Duke of Argyle is reported dangerously ill of gout at his residence. As he is 58 years of age his recovery is regarded as doubtful.

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We clip the following from the London *Journal of Applied Science*, of June 1, 1881:

"Among the American exchanges we receive, this (the Kansas City Review) is one of the best, both for variety of the subjects treated, and the excellence of the articles contributed by many eminent writers on subjects of lasting interest, instead of topics of mere ephemeral importance. There are always good papers on physics, geology, palæontology, astronomy, and ethnology. Many of these we often desire to transfer to our columns. The periodical now enters upon its fifth year."

We learn that the Hon. George B. Loring, the newly appointed Commissioner of Agriculture, will probably reinstate Prof. Riley as Entomologist of that department. Such an act will gratify hosts of friends, not only in Missouri, where the Professor first made his mark, but all over the country, where his ability and zeal are well known and respected.

At about nine o'clock Sunday night, June 19, a large and brilliant meteor was seen passing over this city from southwest to northeast. The nucleus is described as having been as large as a man's head, with a very long tail of a brilliant red color.

ITEMS FROM THE PERIODICALS.

The article on Prehistoric Man, by Prof. E. S. Morse, concluded in this number, was written for the *North American Review*, and is the most exhaustive and comprehensive of any we have seen from any source.

Prof. G. W. Hoss, in sending us a copy of his "Memory Gems," takes occasion to correct our statement of last month that the *Educationist* is a twenty-four page magazine. It is a thirty-two page magazine, and, as we said before, an excellent periodical.

Good Company for May has a long installment of "In the Land of the Midnight Sun," by Lieut. Frederick Schwatka, commander of the Franklin Search Expedition, in which he begins the account of the great Arctic sledge journey, the longest, both in distance and time, ever attempted. It was absent from its base eleven months and a half, and traversed a distance of over 3,200 miles.

The *Atlantic* for July contains, in addition to the installments of Mr. James' and Miss Phelps' serial novels, a great variety of fresh and entertaining matter, including some valuable observations on Trial by Jury in Civil Suits; a picturesque sketch of travel by H. H.; A dissertation on Mischief in the Middle Ages; a paper on Mythology, by Mr. John Fiske; literary criticism, poems, club gossip, etc.

The Popular Science Monthly for June commences with an article upon Physical Education, followed by an illustrated article on Fruits and Seeds; Sunstroke and some of its Sequelæ; The value of our Forests; Production of Sound by Radiant Energy; Compound Political Heads, by Herbert Spencer; Degeneration, by Andrew Wilson; The Natural Production of Alcohol, a translation from the French; an article from Faraday on the Conception of Electricity; Glucose and Grape Sugar,—and a number of other articles, go to make up a most interesting and popular number. D. Appleton & Co., New York.

Van Nostrand's Engineering Magazine, for June, 1881, has been received. A Rational System of Piston Packing, by Prof. Robinson, illustrated; The Metric System; Suggestions for Preventing London Smoke; Roman Building in England and in Italy; Experiments on the Strength of Small Spruce Beams; Gas and Electricity as Heating Agents, by Dr. Siemens; The Effect of Punching on Iron and Steel Plates; The Optical Dynamometer; Capabilities of Standing Heat of Various Building Stones,—make up one of the most interesting numbers of this American *Engineers' Magazine*. D. Van Nostrand, New York.

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